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ANNUAL AIR QUALITY
DATA SUMMARY
FOR
MONTANA

1975

STATE DOCUMENTS

THE MONTANA DEPARTMENT OF HEALTH
AND ENVIRONMENTAL SCIENCES
ENVIRONMENTAL SCIENCES DIVISION
AIR QUALITY BUREAU
HELENA, MONTANA

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I. INTRODUCTION

This report is the first annual air quality data summary published by the Montana Department of Health and Environmental Sciences (DHES). The data presented consists of that data gathered in air quality monitoring in the five Air Quality Control Regions for 1975. This report is divided into two main sections. The first section and the main body of the report is orientated toward the general public who wishes an overall report on the air quality of Montana for 1975. The pollutants addressed in this section are sulfur dioxide and total suspended particulates. The Appendix B is orientated toward individual special studies performed throughout the state. This section summarizes all air pollutants measured in each study area.

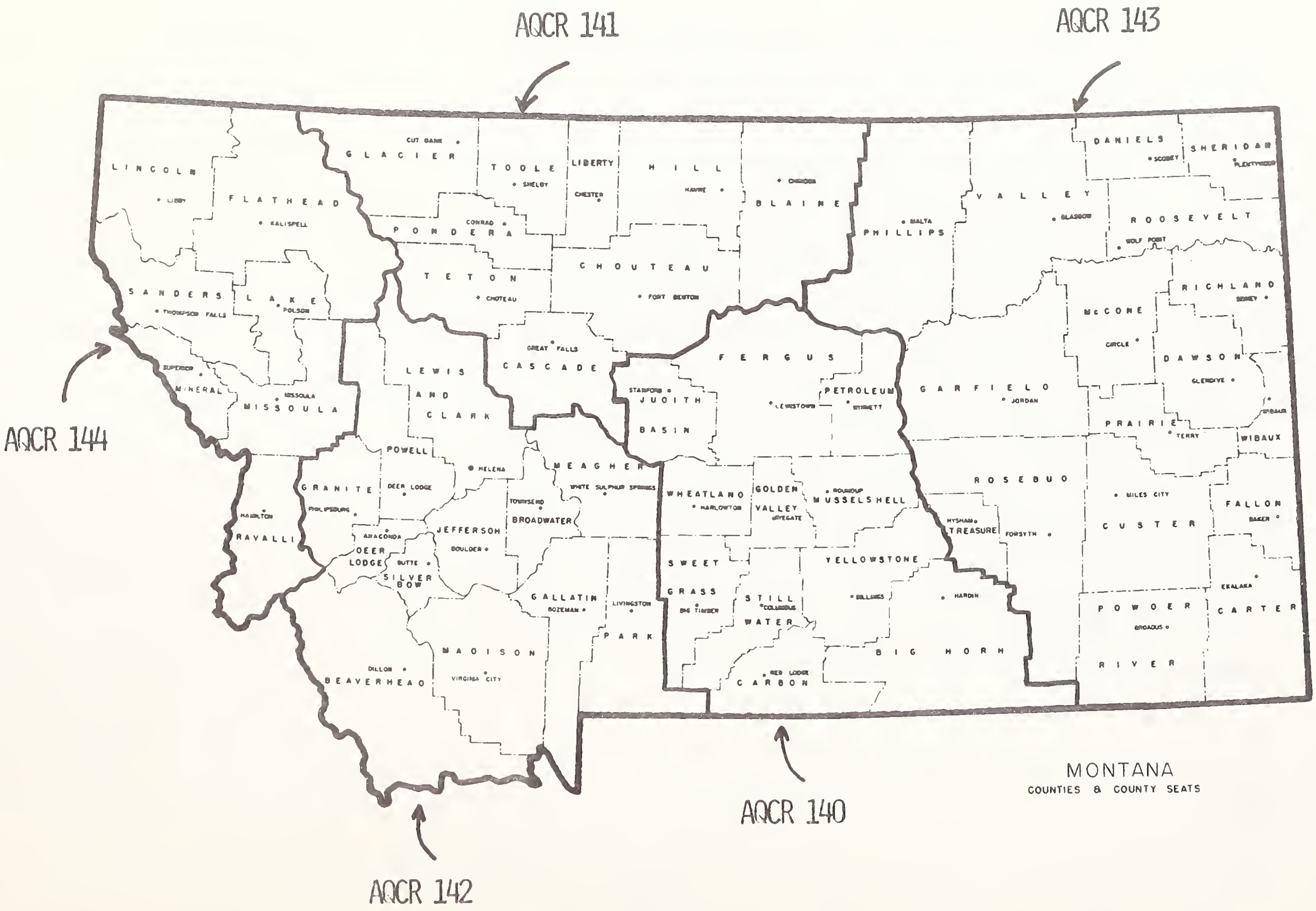
Appendix A summarizes the federal and Montana ambient air quality standards.

The data collected in this report consist of that data gathered by monitoring activities of the Air Quality Bureau of the Montana Department of Health and Environmental Sciences; the Cascade County Air Pollution Control; the Missoula City-County Health Department; and the Yellowstone County Air Pollution Control.

The map in Figure 1 illustrates the five Air Quality Control Regions (AQCR) for Montana. The data in section one of this report discusses the results of monitoring by AQCR.

Figure 1

Montana Air Quality Control Regions



II. GENERAL AIR QUALITY

A. Billings Air Quality Control Region - Region 140

The annual arithmetic mean for total suspended particulates for all stations in Region 140 during 1975 was 47.6 micrograms/cubic meter. The region contains 11 counties and many of the counties are very sparsely populated. Therefore, the levels of particulates vary largely, with the Billings metropolitan area having the highest averages. The Region 140 has a population of 135,243 with 56 percent of these located in the Billings metropolitan area. The Billings stations had a geometric average* at one station of 58.9 micrograms/cubic meter with the highest 24-hour level measured at 161 micrograms/cubic meter. Sulfur dioxide for the region was measured only in the Billings metropolitan area. Measurements showed arithmetic average concentrations of approximately 0.01 parts per million. Table 2 summarizes sulfur dioxide and particulate data for selected sites in the region. Both the federal and Montana ambient air quality standards for particulates and sulfur dioxide were exceeded during 1975.

Primary industries in this region are cattle ranching, farming, oil and gas production, coal mining, and petroleum refining and transportation. Two sawmills are located in this region. Table 1 indicates the estimated emissions from the major sources in the region. Other than the power plant in Billings, the largest sources are the three refineries which emit large quantities of particulates, sulfur dioxide, nitrogen dioxide, hydrocarbons and in one case large quantities of carbon monoxide.

B. Great Falls Air Quality Control Region - Region 141

The annual arithmetic average of total suspended particulates for Region 141 during 1975 was 47.7 micrograms/cubic meter. This region contains 9 counties and one major metropolitan area with much of the region remaining sparsely populated. The

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*Geometric average given here to compare with ambient air quality standards.

TABLE 1

Billings Air Quality Control Region - Region 140

Major Point Sources Estimated Emissions - 1975

Point Source	Estimated Emissions (Tons Per Year) Sulfur Dioxide	Particulates
Cenex Laurel	8,200	398
Conoco Billings	2,204	263
Exxon Billings	9,169	932
Great Western Sugar Co. Billings	9	65
Montana Power Company Billings	11,412	1,726
Montana Sulphur & Chemical Co. Billings	1,610	Neg.

TABLE 2

Billings Air Quality Control Region - Region 140

Selected Stations Ambient Air Quality Data - 1975

	Sulfur Dioxide (Parts Per Million)		Particulates (Micrograms Per Cubic Meter)	
Site	Max. 24-Hour	Arith. Aver.	Max. 24-Hour	Geo. Aver.*
Lockwood School	0.08	0.011	1114.0	36.1
City Hall	---	---	157.0	58.9
Grand Ave. School	---	---	161.0	57.6
#1 Grand	0.06	0.007	---	---
Montana & N. 27th	0.04	0.006	---	---

*Geometric Average

Region 141 had a 1970 census of 144,070 with 49 percent of these residing in the metropolitan area of Great Falls. In the Great Falls area, one station recorded a geometric average of 59.7 micrograms/cubic meter with a maximum 24-hour measurement of 310 micrograms/cubic meter. Only four particulate monitors were operated in the region, therefore, leaving large areas as having unknown particulate levels. Sulfur dioxide was measured at only one location in the Great Falls metropolitan area. Results show no sulfur dioxide detected with the monitor. Table 4 summarizes sulfur dioxide and particulate data for selected sites in the region. The federal primary ambient particulate standard was exceeded on one occasion only and the Montana ambient particulate standard was exceeded four times. The sulfur dioxide ambient air quality standard was not exceeded.

Primary industries in this region are cattle ranching, wheat farming, and oil and gas activities in the northwestern and northeastern areas of the region. Small petroleum refineries are located at Cut Bank, Kevin and Great Falls. Two large grain processing plants are located at Great Falls. These five plants are listed in Table 3 with estimated emissions. The only other source of sulfur dioxide in the region is the Phillips Petroleum Company refinery at Great Falls.

C. Helena Air Quality Control Region - Region 142

The arithmetic average of total suspended particulates for Region 142 during 1975 was 61.7 micrograms/cubic meter. The region contains 12 counties and several metropolitan areas. The region had a 1970 census of 167,100. The three major metropolitan areas where significant monitoring was conducted are Helena, Butte and Anaconda. The area of highest particulate levels was Butte with one station having a geometric average of 100.2 micrograms/cubic meter with a maximum 24-hour level of 368 micrograms/cubic meter. Due to the location of two large sources of sulfur dioxide in the region, the measurements for sulfur dioxide were orientated toward these sources and are not representative of the entire region. The Helena area monitors had an annual average sulfur dioxide concentration of 0.011 parts per

TABLE 3

Great Falls Air Quality Control Region - Region 141

Major Point Sources Estimated Emissions - 1975

Point Source	Estimated Emissions (Tons Per Year) Sulfur Dioxide	Particulates
Big West Oil Co. Kevin	138	111
Con-Agra Great Falls	0	70
General Mills Great Falls	0	32
Phillips Petroleum Great Falls	1,807	72
Westco Refining Cut Bank	883	11

TABLE 4

Great Falls Air Quality Control Region - Region 141

Selected Stations Ambient Air Quality Data - 1975

	Sulfur Dioxide (Parts Per Million)		Particulates (Micrograms Per Cubic Meter)	
Site	Max. 24-Hour	Arith. Aver.	Max. 24-Hour	Geo. Aver.
Cascade Co. Health Dept.	0.0	0.0	218	29.8
Fire Station #1	---	---	310	59.7

million. The maximum 24-hour reading was 0.54 parts per million. In the Anaconda area, the annual average of sulfur dioxide monitors was 0.007 parts per million. The maximum 24-hour reading was 0.18 parts per million. The ambient particulate standards were violated on many occasions in the Butte area and on less occasions elsewhere in the region. The federal and Montana ambient sulfur dioxide standards were violated at several locations in the Helena and Anaconda areas. Table 6 summarizes sulfur dioxide and particulate data for selected sites in the region.

The majority of the point sources of air pollution in Region 142 are wood processing operations including some 14 sawmills with tepee burners. Emissions from these sources include mainly particulates, hydrocarbons and carbon monoxide. The two largest pollution sources in the region, however, are a lead smelter and a copper smelter. Emissions from these sources dominate the air quality in the Helena and Anaconda areas. These sources emit large quantities of carbon monoxide, sulfur dioxide and particulates. Another large pollution source in this region is the Berkeley open pit mine. This source is considered more of an "area" source as the emissions are emitted over a large area. The major emissions from the mine are particulates, hydrocarbons and oxides of nitrogen.

The region also contains one phosphate feed plant* and one elemental phosphorous plant. These sources release mainly fluoride, particulates and sulfur dioxide into the air. Two cement plants and two talc plants are also located in the region. These plants emit mainly particulates and oxides of nitrogen. The region also contains many smaller air pollution sources which contribute to the overall pollution level. These include hot mix plants, incinerators, agricultural burning, motor vehicles and unpaved roads.

Table 5 summarizes the emission estimates from major point sources in the region.

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*The phosphate feed plant has shut down all operations toward the end of 1975.

TABLE 5

Helena Air Quality Control Region - Region 142

Major Point Source Estimated Emissions - 1975

Point Source	Estimated Emissions (Tons per year) Sulfur Dioxide	Particulates
American Smelting & Refining Co. East Helena	80,000	415
Anaconda Company Anaconda	343,500	608
Kaiser Cement Montana City	---*	204
Ideal Cement Trident	---*	263
Pfizer Dillon	5	124
Rocky Mtn. Phosphates Inc. Garrison	---*	38
Stauffer Chemical Co. Silverbow	208	73
U. S. Plywood Silver City	1	13
Townsend Lumber Townsend	1	20
Yellowstone Pine Belgrade	1	15
Elk Studs West Yellowstone	1	12
Burkland Studs Livingston	1	12

*Unknown at this time.

TABLE 6

Helena Air Quality Control Region - Region 142

Selected Stations Ambient Air Quality Data - 1975

Site	Sulfur Dioxide (Parts Per Million) Max. 24-Hour	Sulfur Dioxide (Parts Per Million) Arith. Aver.	Particulates (Micrograms Per Cubic Meter) Max. 24-Hour	Particulates (Micrograms Per Cubic Meter) Geo. Aver.
212 Pacific St. E. Helena	---	---	231.0	63.8
Saddle Mtn. E. Helena	0.54	0.014	---	---
Microwave E. Helena	0.24	0.015	52.0	16.2
C-Hill Anaconda	0.14	0.015	---	---
Hi-way Jct. Anaconda	0.12	0.014	---	---
Greeley School Butte	---	---	368.0	100.2
Atkins Butte	---	---	242.0	43.4
McKinley Res. Granite Co.	---	---	113.0	30.2
Lahman Res. Powell Co.	---	---	153.0	48.5

D. Miles City Air Quality Control Region - Region 143

The annual arithmetic mean for total suspended particulates for Region 143 for 1975 was 19.0 micrograms/cubic meter with a maximum 24-hour level of 130 micrograms/cubic meter. The region contains 17 counties, all of which are fairly sparsely populated. The region has a total population of 97,554. Increased activity is present in this region as it contains major coal fields. Sulfur dioxide was monitored at several locations in the region but no sulfur dioxide was detected. No violations of the federal or Montana ambient air quality standards for particulates or sulfur dioxide were recorded in the region. Table 8 summarizes sulfur dioxide and particulate data for selected sites in the region.

Primary industries in this region consist of cattle ranching, farming, oil and gas production, and coal mining. Estimated emissions from the major sources in the region are listed in Table 7. The two largest emitters in the region are the two power plants presently operating.

The Montana Power Company plant at Colstrip began operating last fall so the start-up problems have not completely been solved. Source testing was conducted in February, 1976, by the state and a private contractor.

The Montana-Dakota Utilities (MDU) power plant at Sidney was recently modified by installing a venturi scrubber and lime slurry scrubbing system for SO_2 and particulate control. Source testing will be done in March, 1976.

The other three plants in Table 7 are in compliance with state emission standards.

E. Missoula Air Quality Control Region - Region 144

The annual arithmetic mean for total suspended particulates for Region 144 during 1975 was 56.4 micrograms/cubic meter. The region consists of 7 counties with a population of 154,691. The major metropolitan area is Missoula, which also recorded the highest average particulate levels. One monitor had an annual geometric average of 68.1 micrograms/cubic meter with the maximum 24-hour level being 240 micrograms/cubic meter. High levels were also recorded in the Columbia Falls and

TABLE 7

Miles City Air Quality Control Region - Region 143

Major Point Source Estimated Emissions - 1975

Point Source	Estimated Emissions (Tons Per Year) Sulfur Dioxide	Particulates
Hallett Minerals Vananda	38	59
Holly Sugar Company Sidney	226	116
Montana Power Co. Unit #1 Colstrip	6,400	460
Montana-Dakota Utilities Sidney	2,560	110
Tumpane Co. Glasgow AFB	171	29

TABLE 8

Miles City Air Quality Control Region - Region 143

Selected Stations Ambient Air Quality Data - 1975

	Sulfur Dioxide (Parts Per Million)		Particulates (Micrograms Per Cubic Meter)	
Site	Max. 24-Hour	Arith. Aver.	Max. 24-Hour	Geo. Aver.
BN Site Colstrip	0.0	0.0	129.0	18.6
Ekalaka Carter Co.	---	---	13.0	7.0
Scobey Daniels Co	---	---	9.0	7.4
Lindsay Dawson Co.	---	---	41.0	12.3
Fort Peck McCone Co.	0.0	0.0	26.0	15.4
Poplar Roosevelt Co.	---	---	69.0	12.7

Kalispell areas. Sulfur dioxide was measured very briefly during 1975 in Region 144. Only three samples were taken with no sulfur dioxide detected. Violations of federal and Montana ambient particulate standards were measured at several locations mainly around the urban areas. Missoula recorded the greatest number of particulate matter violations. The ambient sulfur dioxide standards were not violated. Table 10 summarizes sulfur dioxide and particulate data for selected sites in the region.

The majority of the point sources of air pollution in Region 144 are wood processing operations - some 25 sawmills with tepee burners or wood waste boilers, 5 plywood plants, 2 particleboard plants, a pulp mill, etc. Other sources include an aluminum reduction plant, vermiculite plant and several aggregate processing plants. The emissions from these sources are primarily particulate matter, but the aluminum plant emits large quantities of fluoride and the pulp mill is a significant source of various odorous sulfide compounds.

There are a number of other sources of particulate matter which individually are small but cumulatively can contribute considerably to the total particulate emissions. Included in this group are incinerators, agricultural burning, small heating plants, small manufacturing operations, motor vehicles and others. Probably the two most conspicuous of these "area" sources are forest slash burning and unpaved roads.

Table 9 summarizes emission estimates from the major point sources in the region.

TABLE 9

Missoula Air Quality Control Region - Region 144

Major Point Source Estimated Emissions - 1975

Point Source	Estimated Emissions (Tons Per Year) Sulfur Dioxide	Particulates
Anaconda Aluminum Columbia Falls	---*	1,560
Evans Products (particleboard) Missoula	0	706
Evans Products (plywood) Missoula	4	314
W. R. Grace Libby	1,259	431
Hoerner Waldorf Corporation Missoula	910	988
Plum Creek Lumber Columbia Falls	435	34
St. Regis Paper Libby	1,849	370
U. S. Plywood Bonner	224	842

* Unknown at this time

TABLE 10

Missoula Air Quality Control Region - Region 144

Selected Stations Ambient Air Quality Data - 1975

	Sulfur Dioxide (Parts Per Million)		Particulates (Micrograms Per Cubic Meter)	
Site	Max. 24-Hour	Arith. Aver.	Max. 24-Hour	Geo. Aver.
Courthouse Missoula	0.0	0.0	240.0	68.1
Target Range Missoula	---	---	373.0	38.8
High School Columbia Falls	---	---	232.0	56.7
Sverdrup Libby	---	---	196.0	63.0

III. SPECIAL STUDY AREA WORK

In the Billings AQCR a special study was continued in the Billings-Laurel metropolitan area. This study was conducted for both population and point-source type air pollution sources. The major sources are refineries, chemical and sugar companies and a power plant. Results of the studies indicated violations of federal secondary particulate standards, federal primary ozone, non-methane hydrocarbon and carbon monoxide standards. Violations of the state ambient standard for sulfation rate were also recorded.

In Great Falls AQCR special studies were continued in the Great Falls metropolitan area and were concluded around the oil companies near Kevin and Cut Bank. The Kevin-Cut Bank area study resulted in violations of the state sulfation rate standard. The Great Falls area study resulted in no sulfur dioxide being detected but violations of the state standards for sulfation rate and total dustfall were recorded.

In the Helena AQCR special studies were conducted around various large point sources. In the Helena area, monitoring around the ASARCO lead smelter resulted in violations of the federal secondary and state particulate standards. Also violations of the federal primary and state sulfur dioxide standards were recorded at several locations. The state sulfation rate ambient standard was also violated. In the Anaconda area, monitoring around the Anaconda Company copper smelter resulted in violations of the federal secondary and state sulfur dioxide standards being recorded. The state sulfation rate ambient air standard was also violated. In the Butte area, monitoring was mainly conducted for emissions from the Berkeley open pit mine. Results of monitoring in this area indicated frequent violations of the federal and state particulate standards. Ramsay, located a little west of Butte, was the object of ambient monitoring especially around the Stauffer Chemical Company. Results of this monitoring indicated violations of the state fluoride standard on many occasions. Monitoring in the Garrison area, located north of the Butte - Anaconda area, also resulted in violations of the state fluoride standard. Monitoring in this area was conducted around the Rocky Mountain Phosphate, Inc. plant. Particulate levels exceeded the federal secondary standard. A special study was also concluded in the Philipsburg area. The monitoring was conducted around two tepee burners, the larger of the two closing down early in the year. Violations of the state total dustfall standard were recorded until the tepee burner was shutdown.

In the Miles City AQCR, special studies were conducted for establishing background levels of pollutants in the coal development areas. As was expected, very low concentrations were measured of all pollutants except ozone. Ozone levels approached the federal primary standard. Monitoring was also conducted around a new source that started during the latter part of 1975. This source was the Montana Power Company Colstrip Unit 1. No violations of the ambient air standards were recorded.

In the Missoula AQCR, special studies were continued in the Missoula metropolitan area and the Kalispell-Columbia Falls area. In the Missoula area the study was conducted for population and point-source type air pollution sources. The majority of these sources were wood products related. The results of sampling in the area indicated violations of the federal and state particulate standards. Sulfur dioxide monitoring resulted in levels below the detectable limit of the sampling method. In the Kalispell-Columbia Falls area, monitoring was also conducted mainly for wood products related sources. Results of the sampling indicated violations of federal and state particulate standards. Violations of the state fluoride standard were also recorded around the Anaconda Aluminum Company smelter.

More detailed analyses of the speical studies are presented in Appendix B.

APPENDIX A

AMBIENT AIR QUALITY STANDARDS

Federal Ambient Air Quality Standards

Pollutant	Primary (ug/m^3)	Primary (ppm)	Secondary (ug/m^3)	Secondary (ppm)	Averaging Time
Particulates	75	---	60	---	Annual
	260*	---	150*	---	24-Hour
Sulfur Dioxide	80	0.03	---	---	Annual
	365*	0.14	---	---	24-Hour
	---	---	1,300*	0.5	3-Hour
Carbon Monoxide	10,000*	9.0	---	---	8-Hour
	40,000*	35.0	---	---	1-Hour
Photochemical Oxidants	160*	0.08	---	---	1-Hour
Hydrocarbons	160*	0.24	---	---	3-Hour (6-9 a.m.)
Nitrogen Oxides	100	0.05	---	---	Annual

*Not to be exceeded more than once/year

Federal Area Classifications for Significant Deterioration Regulations

Pollutant	Class I Allowable Increase (ug/m^3)	Class I Allowable Increase (ppm)	Class II Allowable Increase (ug/m^3)	Class II Allowable Increase (ppm)	Class III Not to Exceed (ug/m^3)	Class III Not to Exceed (ppm)
Particulates						
Annual	5	--	10	--	75	--
24-Hour Maximum	10	--	30	--	150	--
Sulfur Dioxide						
Annual	2	0.0007	15	0.0057	80	0.03
24-Hour Maximum	5	0.0019	100	0.038	365	0.14
3-Hour Maximum	25	0.0095	700	0.267	1300	0.50

Montana Ambient Air Quality Standard

Pollutant	Standard	Averaging Time
Suspended Particulates	75 ug/m^3	Annual
	200* ug/m^3	24-Hour
Sulfur Dioxide	0.02 ppm	Annual
	0.10[+] ppm	24-Hour
	0.25[a] ppm	1-Hour
Settled Particulates	15 T/mi^2 (residential area)	3-Month
	30 T/mi^2 (industrial area)	3-Month
Suspended Sulfates	4 ug/m^3	Annual
	12[b] ug/m^3	--
Reactive Sulfur	0.25 mg SO_3/ 100 cm^2/day	Annual
	0.50 mg SO_3/ 100 cm^2/day	1-Month
Fluorides, Total in air (as HG)	1 ppb	24-Hour
Fluorides (Gaseous)	0.3 ug/cm^2/28 days	28-Days

[a] Not to be exceeded for more than one hour in any four consecutive days.

[b] Not to be exceeded more than one percent of the time.

*Not to be exceeded more than one percent of the days in a year.

[+] Not to be exceeded more than one percent of the days in a 3-month period.

APPENDIX B

SPECIAL STUDY AREAS DETAILED ANALYSES

Billings-Laurel Area

In Region 140 a special study was continued in the metropolitan area of Billings. This study was conducted by the Yellowstone County Air Pollution Control and the DHES. It was conducted both for population and point-source type air pollution sources. The major sources monitored were the Montana Power Company Corette Power Plant and the Exxon, Conoco and Cenex refineries. Table 11 summarizes the estimated emissions from the major point sources and the area sources.

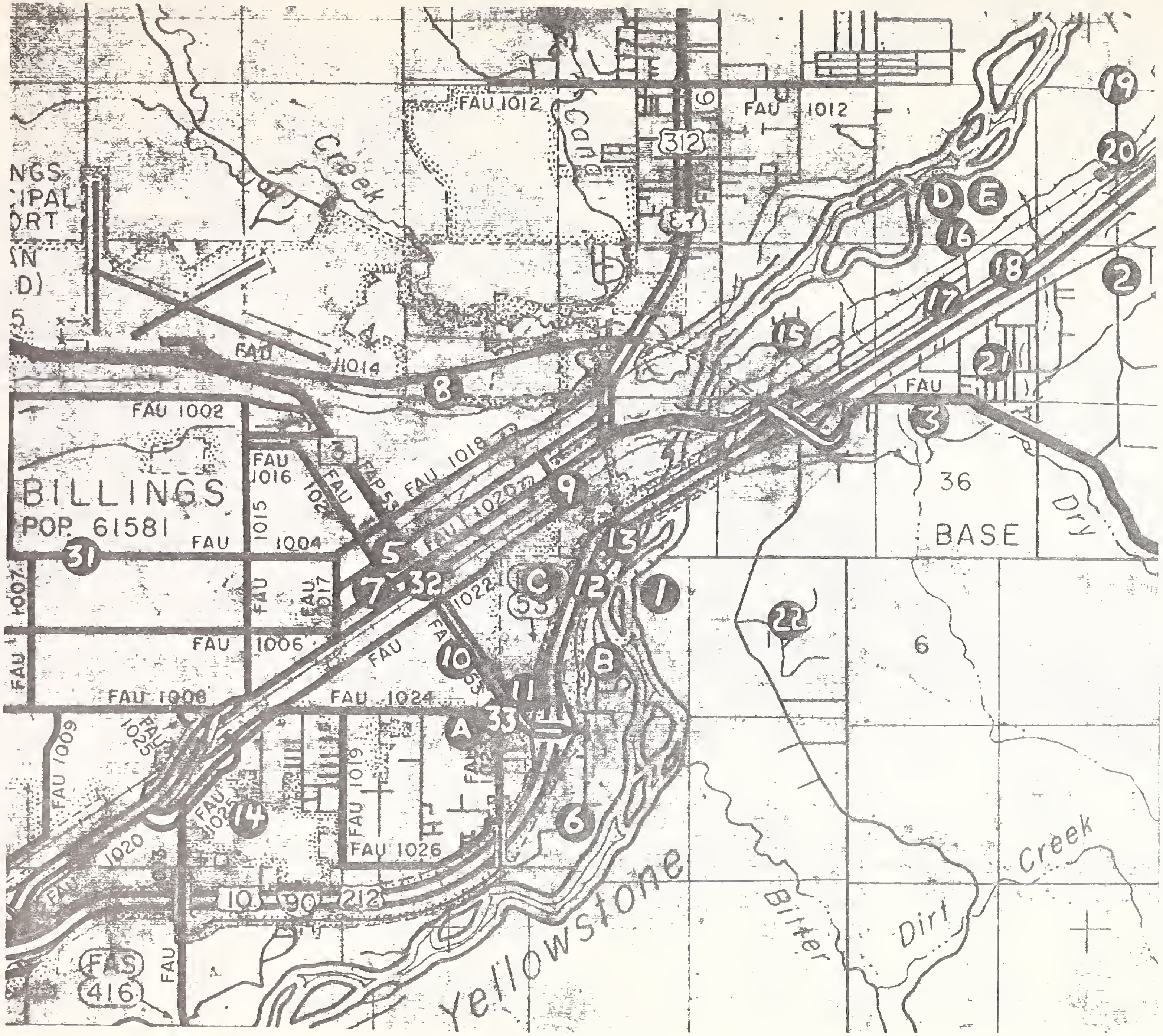
Air pollutants measured consisted of total suspended particulates, sulfur dioxide, sulfation rate, carbon monoxide, hydrocarbons, ozone, hydrogen sulfide and nitrogen dioxide. The maps in Figures 2 & 3 illustrate the approximate locations of the major point sources and the air pollution monitors.

The results of the ambient sampling, summarized in Tables 12 through 15, indicate violations of federal secondary particulate standards, federal primary ozone, non-methane hydrocarbon and carbon monoxide standards. Violations of the state ambient standard for sulfation rate were also recorded. The maximum particulate levels were recorded at the City Hall and Grand Avenue School sites. The City Hall site recorded a maximum 24-hour value of 157 micrograms per cubic meter (ug/m^3) and a geometric mean of 58.9 ug/m^3. The Grand Avenue School site recorded a maximum 24-hour value of 161 ug/m^3 and a geometric mean of 57.6 ug/m^3. The carbon monoxide federal 8-hour standard was exceeded at both the #1 Grand and Montana & N. 27th sites. The maximum 8-hour readings were 10.19 and 13.12 parts per million (ppm), respectively. The federal 3-hour standard for non-methane hydrocarbons was exceeded at the #1 Grand site also. This site recorded a maximum 3-hour reading of 9.50 ppm. The federal 1-hour ozone standard also was exceeded many times at the #1 Grand site. The maximum 1-hour reading was 0.16 ppm. The nitrogen dioxide standard was approached but not exceeded. The annual average at the Montana & N. 27th site was 0.04 ppm. The federal 24-hour sulfur dioxide standard was exceeded at the Laurel Water Plant site with the maximum 24-hour value being 0.218 ppm. The 3/8 Mi. NE of Coop and E of Laurel sites recorded highest average sulfation rate values with both sites exceeding the Montana standard frequently. The sites recorded maximum values of 3.62 and 2.88 mg SO_3/100 cm^2/day, respectively.

Great Western Sugar Company and Montana Sulfur and Chemical Company are in compliance with state emission standards. The Cenex and Exxon refineries are both out of compliance with state sulfur-in-fuel and particulate emission regulations. Both companies were issued Orders to Take Corrective Action for these problems. Additional review is being conducted on the Conoco refinery. Montana Power Company has submitted a compliance schedule for approval by DHES. The Billings area is also the subject of an Air Quality Maintenance Plan for the maintaining of particulate, sulfur dioxide, and carbon monoxide levels within the ambient standards through 1985.

FIGURE 2

Billings Area



Ambient Air Monitors

Map No.	Site Name
1	Sacrifice Cliff
2	Johnson Lane
3	Lockwood School
4*	KGHL Station
5	City Hall
6	Garden Avenue
7	CNR 33 & 2 Ave N.
8	Mtn. View Blvd.
9	1200 Minn. Ave.
10	5th & S. 28th
11	S. 27th & 10 Ave. S.
12	E. Conoco
13	Two Moon Park
14	Newman School
15	Klenck Lane
16	Exxon
17	Piccolo & N Ft. Rd.
18	Hi-Ball Trucking
19	Johnson & Lockwood
20	Johnson Rd. N.
21	Woodland
22	Coburn Rd.
31	Grand Ave. School
32	Montana & N. 27th
33	11th & S. 27th

*Not shown on map

Major Point Sources

Map No.	Source Name
A	Great Western Sugar Co.
B	Montana Power Co.
C	Conoco Refinery
D	Exxon Refinery
E	Mont. Sul. & Chem. Co.

Scale: 1 inch = 1 mile

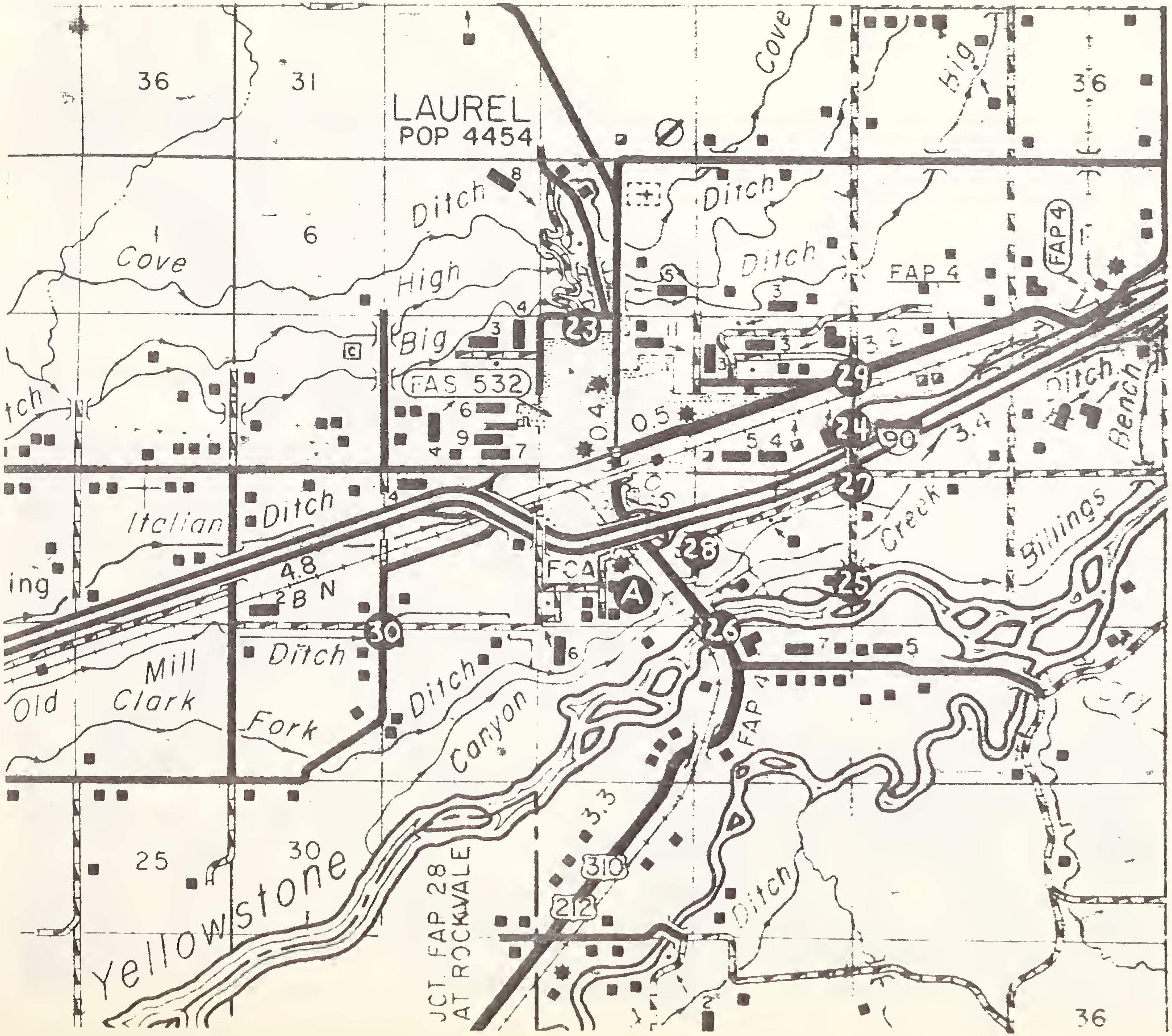


FIGURE 3

Laurel Area
(Yellowstone Co.)

Ambient Air Monitors

Map No.	Site Name
23	Laurel Jr. High
24	1 Mi. NE Coop
25	3/4 Mi. W Coop
26	½ Mi. S Coop
27	E. of Laurel
28	3/8 Mi. NE of Coop
29	Root Beer Stand
30	West Coop

Major Point Source

Map No.	Source Name
A	Cenex Refinery

Scale: 1 inch = 1 mile

TABLE 11

Billings-Laurel Area Major Sources

Estimated Emissions - 1975

(Tons Per Year)

Point Source	SO_2	Part.	NO_x	HC	CO	F
Cenex	8,200	398	540	1,082	31	3
Conoco	2,204	263	1,041	1,936	53,874	3
Exxon	9,169	932	1,401	1,132	2	3
Great Western Sugar Co.	9	65	337	2	11	Neg.
Montana Power Co.	11,412	1,726	6,757	113	375	9
Montana Sulphur & Chem. Co.	1,610	Neg.	4	Neg.	Neg.	---
Area Source*						
Unpaved Roads	---	44,900				
Agriculture	---	3,061				
Other	1,545	2,215				

* Yellowstone County

TABLE 12

TOTAL SUSPENDED PARTICULATE DATA YEARLY SUMMARY YELLOWSTONE COUNTY

JAN. 1975 - Dec. 1975

Values in micrograms per cubic meter

Station*	Minimum	Frequency Distribution (% of values equal to or less than stated one)							Maximum	Arith. Mean	Arith. Std. Dev.	Geo. Mean	Geo. Std. Dev.	Total No. Obs.	Number of Samples Reported per Month											
		10%	30%	50%	70%	90%	95%	98%							Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
Lockwood Sc.	11	18	25	36	47	79	87	110	114	41.9	24.37	36.1	1.35	59	5	4	6	5	5	5	4	5	5	5	5	5
KGHL Station	1	14	24	31	38	53	63	68	73	32.8	16.17	27.5	1.70	57	4	4	6	5	5	5	4	5	5	5	5	4
City Hall	12	29	49	62	74	111	127	152	157	66.3	31.98	58.9	1.30	56	5	4	6	5	5	5	4	3	5	5	5	4
Grand Ave Sch	16	26	42	59	79	102	118	147	161	65.5	32.78	57.6	1.32	50	4	4	5	3	1	5	4	5	5	4	5	5
Laurel Jr Hi	8	16	23	36	40	54	55	79	86	35.4	16.35	31.8	1.27	52	3	2	5	5	5	5	4	5	5	5	5	3

* See Figures 2 and 3.

TABLE 13

Continuous Monitor Data

Yearly Summary Yellowstone County

Values in Parts Per Million

Site	Map* No.	Pollutant	Maximum Reading 1-Hour	3-Hour	8-Hour	24-Hour	Arith. Aver.	Standards Exceeded 1-Hour	3-Hour	8-Hour	24-Hour
#1 Grand	31	Carbon Monoxide	17.00	13.33	10.19	---	1.895	0	---	2	---
		Total Hydrocarbons	5.40	5.00	---	3.55	2.533	---	---	---	---
		Non-Methane HC	10.00	9.50	---	3.64	2.551	---	72	---	---
		Nitrogen Dioxide	0.13	0.06	---	0.04	0.010	---	---	---	---
		Ozone	0.16	0.15	---	0.08	0.035	106	---	---	---
		Sulfur Dioxide	0.15	0.09	---	0.06	0.007	0	0	---	0
Montana & N. 27th	32	Carbon Monoxide	26.50	17.50	13.12	---	3.212	0	---	5	---
		Total Hydrocarbons	30.00	30.00	---	25.67	4.365	---	---	---	---
		Nitrogen Dioxide	0.10	0.10	---	0.07	0.041	---	---	---	---
		Ozone	0.09	0.07	---	0.02	0.011	2	---	---	---
		Sulfur Dioxide	0.15	0.13	---	0.04	0.006	0	0	---	0
Lockwood	3	Sulfur Dioxide	0.23	0.18	---	0.08	0.011	0	0	---	0
11th & S. 27th	33	Carbon Monoxide	9.00	5.90	4.61	---	0.846	0	---	0	---

* See Figures 2 and 3

TABLE 14

Sulfur Dioxide Bubbler Data
Yearly Summary Yellowstone Co.
Values in parts per million

Site	Map* No.	Geometric Mean	Arithmetic Mean	Maximum 24-Hour Value	Dates Site Operated
Lockwood School	3	0.0007	0.0089	0.0340	Oct.-Dec.
Laurel Water Plant	26	0.0004	0.0108	0.2176	Jan.-Dec.
3/4 Mi. NE of Coop	27	0.0023	0.0192	0.1095	Jan.-Dec.
Hi-Ball Trucking	18	0.0028	0.0317	0.1241	Jan.-Sep.

TABLE 15

Sulfation Rate Data Yearly Summary Yellowstone County
Values in milligrams sulfur trioxide per 100 square centimeters per day

Site	Map* No.	Min.	Max.	Aver.	No. Samples	Months Standard Violated	Months Site Operated
Sacrifice Cliff	1	0.09	0.74	0.42	5	2	Apr.-Oct.
Lockwood Sch.	3	0.03	1.05	0.37	12	4	Jan.-Dec.
Johnson Lane	2	0.03	0.69	0.28	12	2	Jan.-Dec.
KGHL Station	4	0.01	0.76	0.21	12	1	Jan.-Dec.
City Hall	5	0.01	0.73	0.16	12	1	Jan.-Dec.
Garden Avenue	6	0.02	0.41	0.14	12	0	Jan.-Dec.
CNR 33 & 2 Ave. N.	7	0.01	0.16	0.04	11	0	Jan.-Dec.
Mtn. View Blvd.	8	0.02	0.08	0.03	12	0	Jan.-Dec.
1200 Minn. Ave.	9	0.04	0.71	0.23	12	1	Jan.-Dec.
5th & S. 28th	10	0.02	0.26	0.07	11	0	Jan.-Dec.
S. 27th & 10 Ave. S.	11	0.03	0.49	0.14	11	0	Jan.-Dec.
East Conoco	12	0.03	0.96	0.43	12	3	Jan.-Dec.
Two Moon Park	13	0.04	0.64	0.29	12	1	Jan.-Dec.
Newman School	14	0.01	0.49	0.12	12	0	Jan.-Dec.
Klenck Lane	15	0.01	0.77	0.30	8	1	Jan.-Dec.
Exxon	16	0.18	1.26	0.57	12	5	Jan.-Dec.
Piccolo & N Ft. Rd.	17	0.16	1.35	0.70	10	7	Jan.-Dec.
Hi-Ball Trucking	18	0.15	1.37	0.72	11	7	Jan.-Dec.
Johnson & Lockwood	19	0.09	1.43	0.54	12	7	Jan.-Dec.
Johnson Rd. N.	20	0.10	2.17	0.72	12	8	Jan.-Dec.
Woodland	21	0.07	0.91	0.50	10	5	Jan.-Dec.
Coburn Road	22	0.14	1.50	0.64	12	9	Jan.-Dec.
Laurel Jr. Hi.	23	0.0	0.04	0.02	10	0	Jan.-Dec.
1 Mi. NE Coop	24	0.04	1.64	0.47	12	6	Jan.-Dec.
3/4 Mi. W of Coop	25	0.03	0.94	0.38	12	3	Jan.-Dec.
Laurel Water Plant	26	0.05	1.76	0.51	12	5	Jan.-Dec.
E. of Laurel	27	0.09	2.88	1.03	12	10	Jan.-Dec.
3/8 Mi. NE of Coop	28	0.90	3.62	1.72	12	12	Jan.-Dec.
Root Beer Stand	29	0.03	0.57	0.14	9	1	Jan.-Sep.
West Coop	30	0.01	0.38	0.09	12	0	Jan.-Dec.

---

* See Figures 2 and 3

Great Falls Area

In Region 141, a study was continued in the Great Falls area by the Cascade County Air Pollution Control. This study was conducted both for population and point-source type air pollution sources. The major industrial sources are Con-Agra grain mill, General Mills flour mill, and Phillips Petroleum refinery. Table 16 summarizes emission estimates for these and other sources.

Sampling was performed for particulate matter (total dustfall and total suspended particulates), sulfation rate, and sulfur dioxide. Results are summarized in Tables 17 through 20. The maps (Figures 4 & 5) indicate the relative location of the air monitors. The results of the sampling indicate violations of federal primary and state particulate standards. No sulfur dioxide was detected in the sampling but violation of the state standards for sulfation rate and total dustfall were violated. The maximum particulate levels were recorded at Fire Station #1 site with a maximum 24-hour reading of 310 micrograms per cubic meter and a geometric mean of 46.1 micrograms per cubic meter. Sulfur dioxide sampling detected no recordable levels at the one site sampled. Maximum sulfation rate values were recorded at the Phillips Refinery E site with a maximum value of 0.58 mg SO_3/100 cm^2/day. The Mountain States site recorded the highest total dustfall readings with a one-month maximum of 68.8 tons/square mile.

Table 16

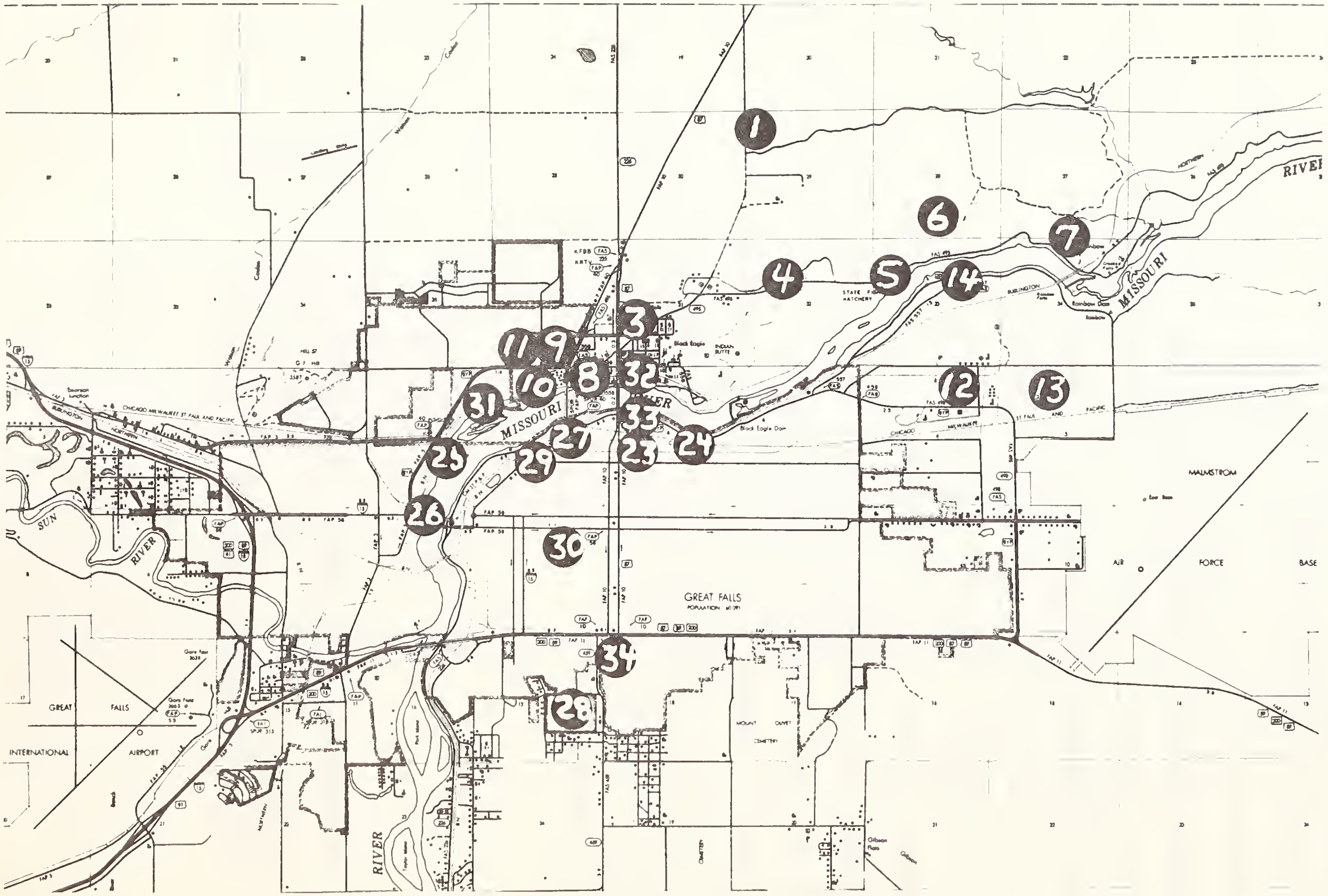
Great Falls Area Major Sources
Estimated Emissions

	Pollutant (Tons Per Year)				
Point Source	SO_2	Part.	NO_x	HC	CO
Con-Agra	0	70	Neg.	Neg.	Neg.
General Mills	0	32	Neg.	0	0
Phillips Petroleum	1807	72	142	1404	10,579

FIGURE 4

Great Falls Area

Ambient Air Monitors



Map No.	Site Name
1	ACM North
3	Stock Car Track
4	ACM East #1
5	Giant Springs
6	Mt. Power Substa.
7	Rainbow
8	Phillips Ref E
9	Phillips Ref N #1
10	Phillips Ref S
11	Phillips Ref N #2
12	Conoco W
13	Conoco E
14	River Road
23	Super America
24	Mountain States
25	Fairgrounds
26	Central West
27	J & J Cafe
28	Cascade Co. H.D.
29	City Sewage Pump
30	Fire Sta #1
31	K-Mart
32	15th St. Br. N.
33	15th St. Br. S.
34	Holiday Village

Scale: 1 inch = 1.3 miles

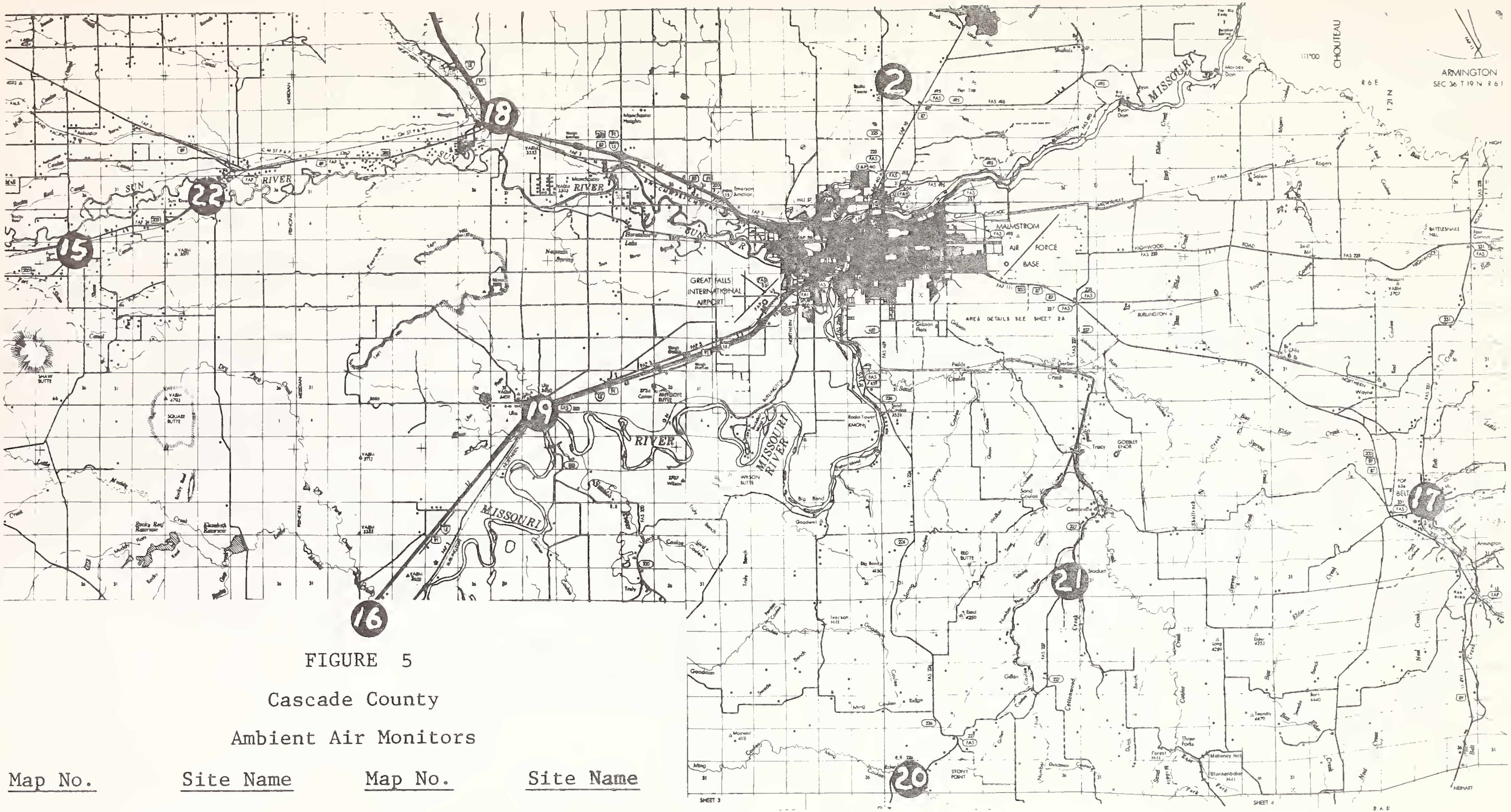


FIGURE 5

Cascade County

Ambient Air Monitors

Map No.	Site Name	Map No.	Site Name
2	Treasurelite	19	Ulm
15	Fort Shaw	20	Eden
16	Cascade Fire Hall	21	Stockett
17	Belt	22	Sun River
18	Vaughan		

Scale: 1 inch = 4 miles

TABLE 17

TOTAL SUSPENDED PARTICULATE DATA YEARLY SUMMARY CASCADE COUNTY

JAN. 1975 - DEC. 1975

Station*	Minimum	Frequency Distribution (% of values equal to or less than stated one)							Maximum	Arith. Mean	Arith. Std. Dev.	Geo. Mean	Geo. Std. Dev.	Total No. Obs.	Number of Samples Reported per Month											
		10%	30%	50%	70%	90%	95%	98%							Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
Belt	12	12	12	16	40	75	75	75	75	35.8	29.00	27.5	2.05	4	0	0	0	0	0	0	0	0	0	0	0	4
Belt Cr Ran	4	6	10	12	19	25	28	49	49	16.1	10.23	13.6	1.41	19	0	3	2	0	5	0	3	5	1	0	0	0
Cascade Co. Health Dept.	4	11	19	30	40	71	93	111	218	38.1	30.85	29.8	1.64	94	4	8	9	9	8	9	8	6	9	9	7	8
Fire Stat #1	16	30	43	60	74	117	147	203	310	70.1	46.12	59.7	1.36	83	4	6	8	8	8	5	9	7	8	6	6	8

* See Figures 4 and 5

TABLE 18

Sulfur Dioxide Bubbler Data

Yearly Summary Cascade County

Values in parts per million

Site	Map* No.	Geometric Mean	Arithmetic Mean	Maximum 24-Hour Value	Dates Site Operated
Cascade Co. Health Dept.	28	0	0	0	Feb.-Oct.

* See Figure 4.

TABLE 19

Total Dustfall Data

Yearly Summary Cascade County

Values in Tons Per Square Mile

Site	Map* No.	Min.	Max.	Aver.	No. Samples	Times Standard Violated	Months Site Operated
Treasurelite Plt.	2	3.43	20.33	12.55	11	5	Jan.-Dec.
Giant Springs	5	1.72	26.09	10.76	12	3	Jan.-Dec.
Belt	17	2.75	9.91	7.57	11	0	Jan.-Dec.
Eden	20	3.02	7.04	5.15	11	0	Jan.-Dec.
Mountain States	24	2.88	68.81	26.84	12	7	Jan.-Dec.
Fairgrounds	25	1.35	46.98	11.56	11	3	Jan.-Dec.
Cascade Co. Health Dept.	28	1.40	13.63	7.96	11	0	Jan.-Dec.
Fire Station #1	30	5.24	31.81	14.05	12	6	Jan.-Dec.

* See Figures 4 and 5.

TABLE 20

Sulfation Rate Data Yearly Summary Cascade County

Values in Milligrams Sulfur Trioxide Per 100 Square Centimeters Per Day

Site	Map* No.	Min.	Max.	Aver.	No. Samples	Months Standard Violated	Months Site Operated
ACM North	1	0.038	0.287	0.113	10	0	Jan.-Nov.
Treasurelite	2	0.0	0.098	0.042	11	0	Jan.-Dec.
Stock Car Track	3	0.022	0.594	0.191	12	1	Jan.-Dec.
ACM East #1	4	0.003	0.280	0.103	12	0	Jan.-Dec.
Giant Springs	5	0.020	0.239	0.069	11	0	Jan.-Dec.
Mt. Power Substa.	6	0.003	0.200	0.080	10	0	Jan.-Dec.
Rainbow	7	0.0	0.187	0.059	10	0	Jan.-Dec.
Phillips Ref. E	8	0.022	0.580	0.250	12	2	Jan.-Dec.
Phillips Ref. N #1	9	0.091	0.588	0.289	12	1	Jan.-Dec.
Phillips Ref. S	10	0.066	0.401	0.181	10	0	Jan.-Dec.
Phillips Ref. N #2	11	0.073	0.284	0.149	11	0	Jan.-Dec.
Conoco W	12	0.012	0.169	0.059	10	0	Jan.-Dec.
Conoco E	13	0.024	0.153	0.065	12	0	Jan.-Dec.
River Road	14	0.0	0.117	0.061	8	0	Jan.-Dec.
Fort Shaw	15	0.006	0.090	0.034	12	0	Jan.-Dec.
Cascade Fire Hall	16	0.024	0.196	0.072	12	0	Jan.-Dec.
Belt	17	0.009	0.181	0.052	12	0	Jan.-Dec.
Vaughn	18	0.008	0.059	0.032	12	0	Jan.-Dec.
Ulm	19	0.004	0.125	0.040	12	0	Jan.-Dec.
Eden	20	0.0	0.074	0.014	12	0	Jan.-Dec.
Stockett	21	0.014	0.123	0.066	12	0	Jan.-Dec.
Sun River	22	0.0	0.066	0.023	12	0	Jan.-Dec.
Super America	23	0.006	0.192	0.064	11	0	Jan.-Dec.
Mountain States	24	0.009	0.202	0.090	11	0	Jan.-Dec.
Fairgrounds	25	0.0	0.087	0.035	12	0	Jan.-Dec.
Central West	26	0.0	0.144	0.053	12	0	Jan.-Dec.
J & J Cafe	27	0.006	0.271	0.091	12	0	Jan.-Dec.
Cascade Co. Health Dept.	28	0.0	0.085	0.021	10	0	Jan.-Dec.
City Sewage Pump	29	0.0	0.129	0.067	11	0	Jan.-Dec.
Fire Station #1	30	0.0	0.084	0.040	11	0	Jan.-Dec.
K-Mart	31	0.006	0.115	0.042	7	0	Jun.-Dec.
15th St. Br. N.	32	0.004	0.322	0.114	7	0	Jun.-Dec.
15th St. Br. S.	33	0.006	0.158	0.055	5	0	Jun.-Dec.
Holiday Village	34	0.009	0.065	0.041	7	0	Jun.-Dec.

*See Figures 4 and 5.

Kevin-Cut Bank Area

In Region 141, a brief special study was performed in the Kevin-Cut Bank area by the DHES. This study was conducted around the Big West Oil Company near Kevin and the Westco Refining plant near Cut Bank. Both of these sources emit significant amounts of sulfur dioxide and particulates (See Table 3).

Monitoring was performed only for sulfation rate (indicator of sulfur oxides). Results for this sampling are summarized in Tables 21 & 22. Results indicate violations of the state standard near both sources. The Kevin #3 site recorded the highest readings around the Big West Oil Company with a maximum one-month reading of 1.01 mg SO_3/100 cm^2/day. The Cut Bank #2 site recorded the highest readings around the Westco Refining plant. The maximum one-month reading was 2.23 mg SO_3/100 cm^2/day.

Table 21

Sulfation Rate Data Yearly Summary Toole County

Values in milligrams sulfur trioxide
per 100 square centimeters per day

Site	Min.	Max.	Aver.	NO. Samples	Months Standards Violated	Months Site Operated
Kevin #1	0.20	0.41	0.31	7	0	Jan-July
Kevin #2	0.08	0.19	0.13	7	0	Jan-July
Kevin #3	0.42	1.01	0.73	7	4	Jan-July
Kevin #4	0.29	0.42	0.38	3	0	Jan-March
Kevin #5	0.27	0.62	0.43	6	2	Feb-July
Kevin #6	0.13	0.39	0.22	7	0	Jan-July
Kevin #7	0.09	0.25	0.18	7	0	Jan-July

Table 22

Sulfation Rate Data Yearly Summary Glacier County

Values in milligrams sulfur trioxide
per 100 square centimeters per day

Site	Min.	Max.	Aver.	No. Samples	Months Standard Violated	Months Site Operated
Cut Bank #1	0.43	0.84	0.77	7	6	Jan-July
Cut Bank #2	2.12	2.23	2.19	7	7	Jan-July
Cut Bank #3	0.42	0.94	0.77	7	6	Jan-July
Cut Bank #4	0.29	0.94	0.74	7	6	Jan-July
Cut Bank #6	0.49	0.49	0.40	2	0	Feb-Mar

Helena-East Helena Area

In Region 142 a special study was continued in the Helena-East Helena area jointly by the DHES and the Environmental Protection Agency. This study was orientated toward American Smelting and Refining Company, Incorporated at East Helena. The lead smelter is a source of sulfur dioxide, particulates and carbon monoxide (See Table 5).

Sampling was performed in the area for sulfur dioxide, particulate matter and sulfation rate (indicator of sulfur dioxide and other sulfur oxides). Tables 24 through 26 summarize the data obtained in the study. Figure 6 (refer also to Table 23) shows the location of the source and the air monitors. Violations of the federal secondary and state particulate standards were recorded. Also violations of the federal primary and state sulfur dioxide standards were recorded at several locations. The state sulfation rate ambient standard was also violated. The maximum particulate levels were recorded at the 212 Pacific Street site with a maximum 24-hour value of 231 micrograms per cubic meter and a geometric mean of 63.8 micrograms per cubic meter. The maximum sulfur dioxide levels were recorded at the Microwave and Saddle Mountain sites. The maximum 24-hour readings recorded were 0.24 and 0.54 ppm, respectively. Highest average sulfation rate values were recorded at the Kleffner NW and McClellan Creek sites with values of 0.333 and 0.412 mg $SO_3/100\ cm^2$/day.

ASARCO, Incorporated, is on a program which will control both particulate matter and sulfur dioxide from the sintering operations. ASARCO is putting in a 500 T/day sulfuric acid plant which will control 75% of the sulfur dioxide now escaping to the atmosphere from the sintering operations. Sulfur dioxide emissions will decrease from approximately 80,000 T/yr to approximately 24,000 T/yr. Particulate emissions will decrease from 415 T/yr to approximately 370-375 T/yr due to the installation of a baghouse. The baghouse will replace the present electrostatic precipitator which was installed in 1929. The control program will be completed by July 31, 1977.

The Helena area (Lewis & Clark County) is also the subject of an Air Quality

Maintenance Plan. This plan will set down steps to maintain the ambient sulfur dioxide levels to within the standards through 1985.

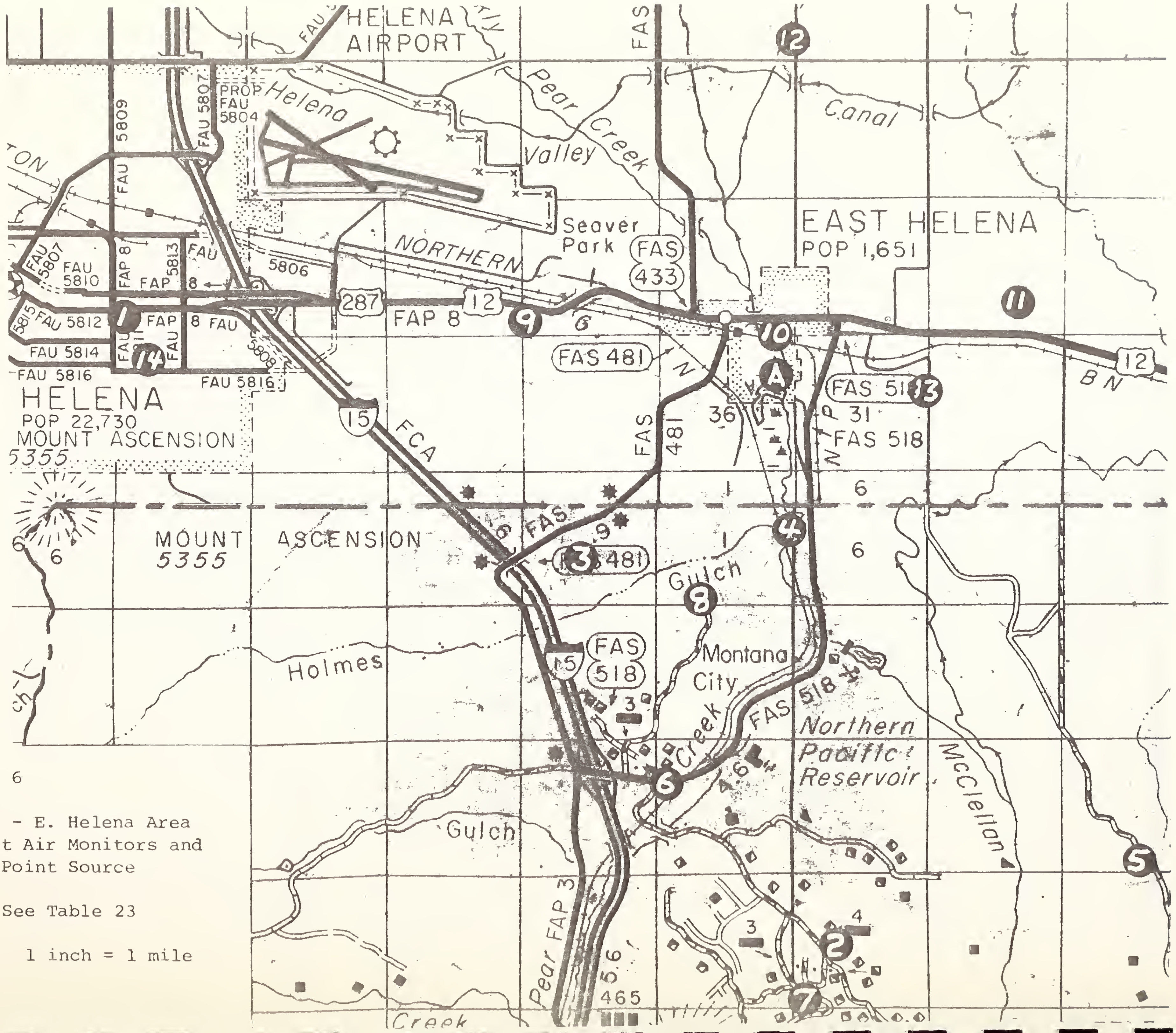


FIGURE 6

Helena - E. Helena Area
Ambient Air Monitors and
Major Point Source

Key - See Table 23

Scale: 1 inch = 1 mile

TABLE 23

Helena-East Helena Area

Ambient Air Monitors and Sources

(Key to Figure 6)

Ambient Air Monitors

Map No.	Site Name
1	Wake Res.
2	McGlenns
3	S. of Stack
4	Kleffner NW
5	McClellan Crk.
6	Montana City School
7	Saddle Mountain
8	Microwave
9	Johnson Ranch
10	212 Pacific St.
11	K. Diehl Ranch
12	North Station
13	East Stack
14	Cogswell Building

Major Point Source

Map No.	Source Name
A	ASARCO, Inc.

TABLE 24

TOTAL SUSPENDED PARTICULATE DATA YEARLY SUMMARY HELENA AREA

JAN. 1975 - DEC. 1975

		Frequency Distribution (% of values equal to or less than stated one)													Number of Samples Reported per Month											
Station*	Minimum	10%	30%	50%	70%	90%	95%	98%	Maximum	Arith Mean	Arith. Std. Dev.	Geo. Mean	Geo. Std. Dev.	Total No. Obs.	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
Microwave	7	7	11	13	22	34	34	52	52	19.8	13.77	16.2	1.52	12	0	0	0	0	0	0	0	0	0	4	4	4
212 Pacific St	8	29	46	66	98	136	151	223	231	77.5	48.73	63.8	1.55	54	11	6	5	5	5	2	0	0	5	5	5	5

TABLE 25

Sulfur Dioxide Data Yearly Summary Helena Area

Values in parts per million

		Maximum Reading				Number of Readings Exceeding				
Site	Map* No.	1-Hour	3-Hour	24-Hour	Arith. Aver.	1-Hour of 0.25	3-Hour of 0.50	24-Hour of 0.10	24-Hour of 0.14	Dates Site Operated
Cogswell Bldg.	14	0.21	0.12	0.03	0.001	0	0	0	0	Jan.-Dec.
East Stack	13	0.23	0.18	0.08	0.006	0	0	0	0	Aug.-Dec.
McClellan Crk.	5	0.56	0.49	0.26	0.020	26	0	6	1	Jan.-Jun.
Microwave	8	0.77	0.63	0.24	0.015	73	2	4	2	Jan.-Dec.
Saddle Mtn.	7	1.68	1.26	0.54	0.014	82	23	11	3	Jan.-Dec.

* See Figure 6.

TABLE 26

Sulfation Rate Data

Yearly Summary Helena Area

Values in Milligrams Sulfur Trioxide Per 100 Square Centimeters Per Day

Site	Map* No.	Min.	Max.	Aver.	No. Samples	Months Standard Violated	Months Site Operated
Wake Res.	1	0.08	0.29	0.152	9	0	Jan.-Nov.
McGlenns	2	0.14	0.92	0.275	11	1	Jan.-Nov.
S. of Stack	3	0.08	0.70	0.297	5	1	Jan.-Sept.
Kleffner NW	4	0.07	0.76	0.333	11	2	Jan.-Nov.
McClellan Crk.	5	0.29	0.63	0.412	5	1	Jan.-May
Montana City School	6	0.0	0.30	0.133	11	0	Jan.-Nov.
Saddle Mtn.	7	0.07	0.73	0.235	12	1	Jan.-Dec.
Microwave	8	0.12	0.68	0.302	12	1	Jan.-Dec.
Johnson Ranch	9	0.11	0.30	0.174	7	0	Jan.-Nov.
212 Pacific St.	10	0.12	0.50	0.251	12	0	Jan.-Dec.
K. Diehl Ranch	11	0.12	0.49	0.245	10	0	Jan.-Nov.
North Station	12	0.08	0.37	0.167	11	0	Jan.-Nov.

* See Figure 6.

Anaconda Area

A special study was continued in Region 142 in the Anaconda area jointly by the DHES and the Environmental Protection Agency. This study was orientated toward the Anaconda Company copper smelter. The smelter is a large source of sulfur dioxide and particulates (See Table 28).

The Anaconda Company smelting complex at Anaconda, Montana consists of two plants, the pyrometallurgical smelter and the hydrometallurgical smelter. The two plants can produce 35 million and 6 million pounds of copper per month. However, legal agreements limit the combined output to 35 million pounds per month.

Major processes at this complex consist of four reverberatory furnaces, the electric furnace, 6 converters, two refining furnaces, a baghouse, an electrostatic precipitator, a sulfuric acid plant, two lime kilns, a boiler house, the Arbiter plant, concentrate drying and blending area, tailings ponds and slag pile. Control units in use at the smelter are summarized in Table 27.

The Anaconda Company currently has variances for particulate emissions from the main stack and from the 90% SO_2 control rule which applies to the smelter. Compliance with both of these rules is related to completion of new smelting facilities followed by expansion of the sulfuric acid plant. Compliance with the particulate emission rule will be achieved for the main stack and matte tapping hoods when the reverberatory furnaces are shut down (probably in 1975). Compliance with an interim 75% control rule will be achieved in early 1977, followed by a 6 month review of the applicable standards.

The Anaconda-Butte area is also the subject of an Air Quality Maintenance Plan for maintaining particulate and sulfur dioxide levels within the standards through 1985.

Sampling was performed in the area for sulfur dioxide and sulfation rate (indicator of sulfur oxides). Tables 29 and 30 summarize the data obtained in the study. Figure 7 also shows the relative locations of the source and the air monitors.

Violations of the federal secondary and state sulfur dioxide standards were recorded at several locations. The state sulfation rate ambient standard was also violated. The C-Hill, Hi-way Jct. and Mill Creek R.R. sites recorded the highest sulfur dioxide concentrations. The C-Hill site recorded a maximum 1-hour value of 1.79 ppm and a 3-hour value of 0.86. The three sites had annual arithmetic averages of 0.015, 0.014 and 0.012 ppm, respectively. The Hi-way Jct. and Mill Creek R.R. sites also recorded the highest sulfation rate concentrations. The Hi-way Jct. site had a one-month value of 1.81 mg SO_3/100 cm^2/day whereas the two sites had annual average concentrations of 0.469 and 0.401 mg SO_3/100 cm^2/day, respectively.

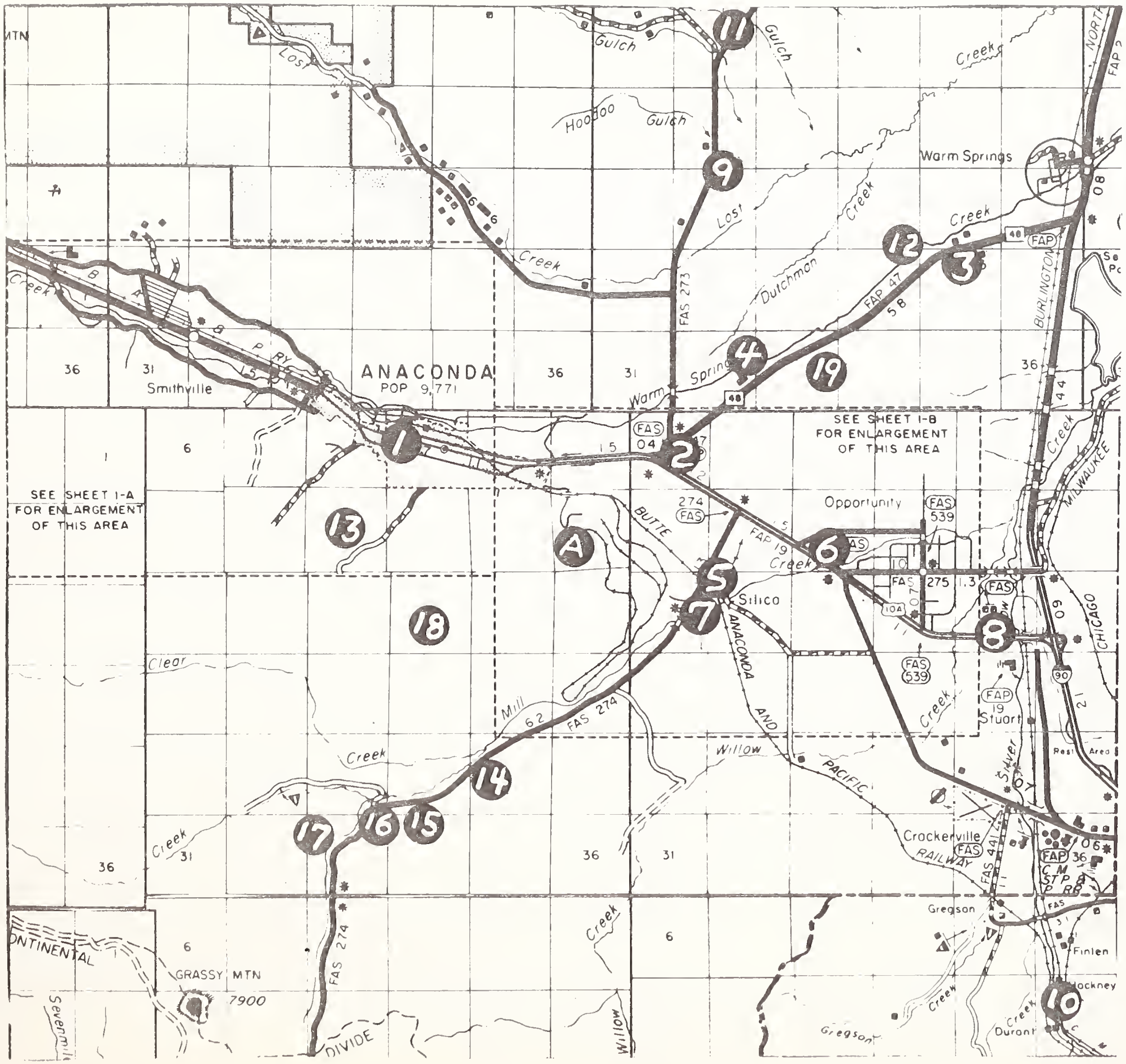


FIGURE 7

Anaconda Area

Ambient Air Monitors

Map No.	Site Name
1	Post Office
2	Hiway Junction
3	Johnson Ranch
4	Anaconda Airport
5	Mill Creek RR
6	Golf Course Exit
7	Wally Johnson Residence
8	Opportunity Main St.
9	Poor Farm
10	Durant Canyon
11	Antelope Creek
12	Pump House
13	A-Hill
14	B-Hill
15	D-Hill
16	E-Hill
17	F-Hill
18	C-Hill
19	Tailings Pond

Major Point Source

Map No.	Source Name
A	Anaconda Company

Scale: 1 inch = 2 miles

TABLE 27

Anaconda Smelter Control Systems

Source	Pollutant	Control Unit
Reverberatory & electric furnaces	Particulates	Baghouse & ESP
Reverberatory & electric furnaces	Sulfur oxides	None
Reverb. matte tapping hoods	Particulates	None
Reverb. matte tapping hoods	Sulfur oxides	None
Converters	Particulates	Sulfuric acid plant (partial)
Converters	Sulfur oxides	Sulfuric acid plant (partial)
Refining furnaces	Particulates	None
Lime kiln no. 1	Particulates	Wet scrubber
Lime kiln no. 2	Particulates	Wet scrubber
Elec. furnace tapping hoods	Particulates	Baghouse and ESP
Elec. furnace tapping hoods	Sulfur oxides	Sulfuric acid plant (partial)
Tailings ponds	Particulates	Covering with limestone culls
Arbiter plant - lead anode area	Particulates	Baghouse

TABLE 28

Anaconda Smelter Complex

Estimated Emissions (Tons Per Year)

Point Source	Part.	SO_x	NO_x	HC	CO
Main Stack	375	328,500	---	---	---
Sulfur Plant Stack	5	380	---	---	---
Converter Building	---*	14,600	---	---	---
Boilers	45	3	---	---	---
Lime Kilns	183	Neg.	---	---	---

* --- indicates emissions are unknown at this time.

TABLE 29

Sulfur Dioxide Data

Yearly Summary Anaconda Area

Values in parts per million

Site	Map* No.	Maximum Reading 1-hour	3-hour	24-hour	Arith. Aver.	Number of Readings Exceeding 1-hour of 0.25	3-hour of 1.50	24-hour of 0.10	24-hour of 0.14	Dates Site Operated
Antelope Cr.	11	0.40	0.31	0.07	0.005	5	0	0	0	Jan.-May
C-Hill	18	1.79	0.86	0.14	0.015	3	3	1	0	December
Hiway Jct.	2	0.75	0.39	0.12	0.014	23	0	2	0	Jun.-Dec
Mill Creek RR	5	0.83	0.63	0.18	0.012	21	3	2	0	Jun.-Dec
Post Office	1	0.64	0.48	0.12	0.004	17	0	1	0	Jan.-Dec
Pumphouse	12	0.35	0.19	0.07	0.005	2	0	0	0	Jun.-Dec
Tailings Pond	19	0.33	0.29	0.05	0.005	2	0	0	0	Jan.-May

*See Figure 7.

TABLE 30

Sulfation Rate Data

Yearly Summary Anaconda Area

Values in Milligrams Sulfur Trioxide Per 100 Square Centimeters Per Day

Site	Map* No.	Min.	Max.	Aver.	No. Samples	Months Standard Violated	Months Site Operated
Post Office	1	0.06	0.52	0.244	10	2	Jan.-Nov.
Hiway Jct.	2	0.13	1.81	0.469	11	2	Jan.-Nov.
Johnson Ranch	3	0.08	0.34	0.183	10	0	Jan.-Nov.
Anaconda Airport	4	0.16	0.88	0.321	9	1	Jan.-Sept.
Mill Creek RR	5	0.14	0.80	0.401	11	2	Jan.-Nov.
Golf Course Exit	6	0.08	0.28	0.172	11	0	Jan.-Nov.
Wally Johnson Res.	7	0.11	0.56	0.241	9	1	Jan.-Nov.
Opportunity Main St.	8	0.04	0.21	0.139	11	0	Jan.-Nov.
Poor Farm	9	0.02	0.48	0.183	9	0	Jan.-Sep.
Durant Canyon	10	0.0	0.30	0.118	9	0	Jan.-Sep.
Antelope Creek	11	0.11	0.40	0.176	5	0	Jan.-May
Pump House	12	0.06	0.19	0.125	4	0	Jul.-Nov.
A-Hill	13	0.01	0.15	0.060	3	0	Oct.-Dec.
B-Hill	14	0.01	0.03	0.020	3	0	Oct.-Dec.
D-Hill	15	0.0	0.03	0.015	2	0	Oct.-Dec.
E-Hill	16	0.02	0.04	0.027	3	0	Oct.-Dec.
F-Hill	17	0.0	0.01	0.003	3	0	Oct.-Dec.

* See Figure 7.

Butte Area

A study was continued in the Butte area for particulate emissions. The major source in the area is the Berkeley Open Pit Mine. Emissions from transferring ore and heavy duty vehicle traffic emit large quantities of particulates, sulfur dioxide, hydrocarbons and oxides of nitrogen. Estimates of particulates alone average some 6000 tons per year. Much of this particulate matter settles over the city and is re-entrained by vehicle traffic on city streets. Other sources in the area include a tepee burner, three hot mix plants, and a concentrator and crusher that process the ore from the mine. These sources, although insignificant compared to the emissions from the mine, do contribute to the overall pollution level.

Table 31 summarizes the data collected in the area. The map in Figure 8 shows the relative locations of the Berkeley Mine and the air monitors. Violations of federal and state particulate standards occurred frequently in the area. The Greeley School and Atkins sites recorded the highest 24-hour particulate concentrations with the maximum at each site being 368 and 242 ug/m^3, respectively. The Greeley School and Silver Bow General Hospital sites recorded the highest annual geometric means with values of 100.2 and 53.9 ug/m^3, respectively.

The Butte-Anaconda area is also the subject of a plan being written to maintain the air quality in compliance with ambient air quality standards through 1985. The plan (Air Quality Maintenance Plan) is being written for particulates and sulfur dioxide.

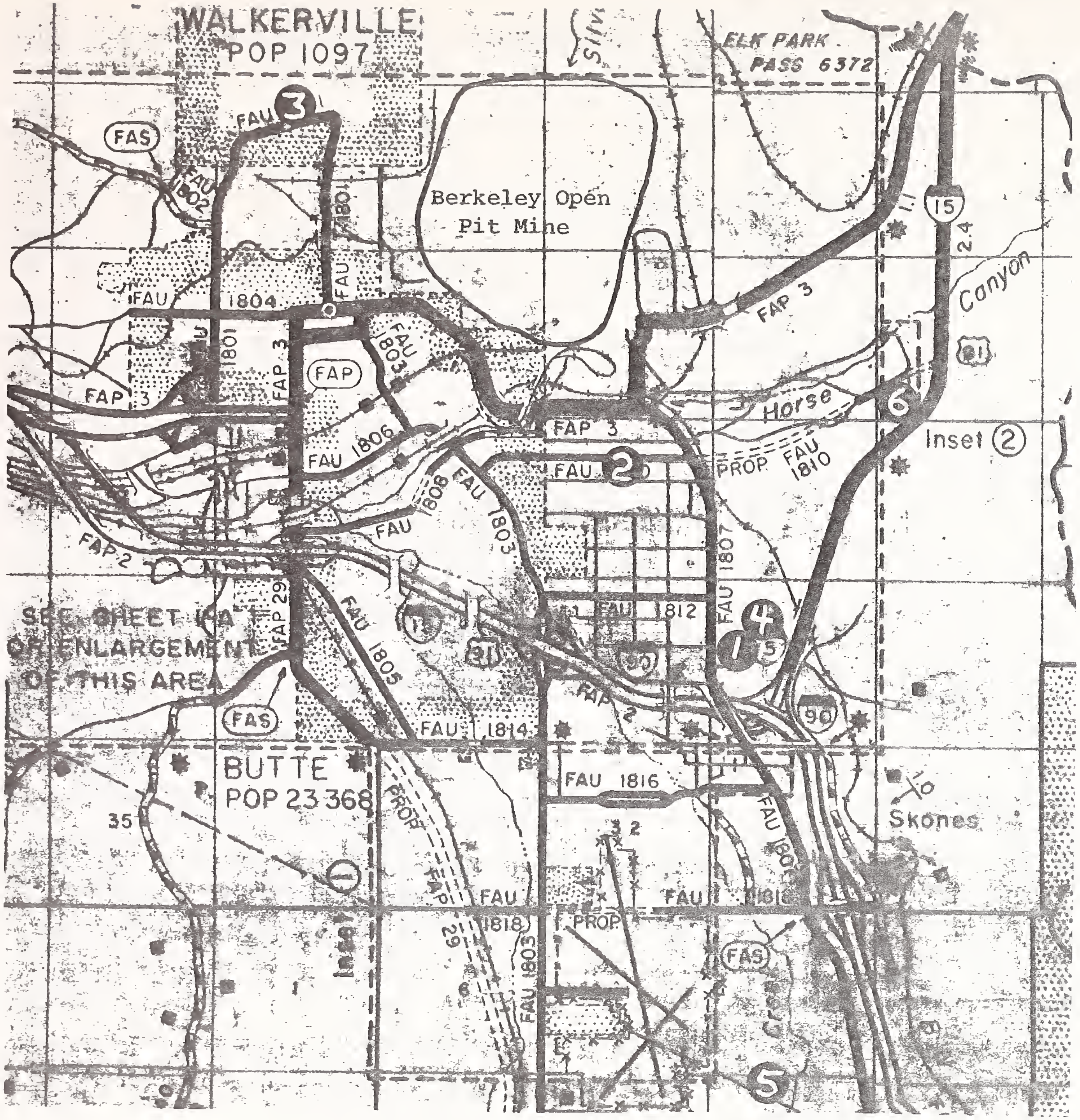


FIGURE 8

Butte Area

Ambient Air Monitors

Map No.	Site Name
1	Silver Bow Gen Hosp
2	Greeley School
3	Atkins
4	Hillcrest
5	Richer Residence
6	Columbia Gardens

Scale: 1 inch = 1 mile

TABLE 31

TOTAL SUSPENDED PARTICULATE DATA YEARLY SUMMARY DEER LODGE VALLEY

JAN. 1975 - DEC. 1975

Station*	Minimum	Frequency Distribution (% of values equal to or less than stated one)							Maximum	Arith. Mean	Arith. Std. Dev.	Geo. Mean	Geo. Std. Dev.	Total No. Obs.	Number of Samples Reported Per Month											
		10%	30%	50%	70%	90%	95%	98%							Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
Sil Bow Gen Butte	26	30	44	53	72	78	87	96	98	57.2	19.56	53.9	1.14	39	0	0	0	0	4	7	9	9	9	0	0	1
Greeley Sch Butte	20	45	69	106	138	199	248	302	368	119.8	72.58	100.2	1.46	80	5	9	11	8	9	8	9	1	8	4	6	2
Atkins Butte	5	13	29	46	68	102	119	160	242	56.6	42.22	43.4	1.84	53	0	4	6	5	4	5	5	5	5	3	5	6
Hillcrest Butte	14	15	21	34	45	89	91	97	111	40.8	25.76	34.4	1.41	34	5	7	10	8	4	0	0	0	0	0	0	0
Richer Res. Butte	5	10	13	18	24	29	32	36	54	19.5	8.79	17.7	1.23	51	0	0	0	0	4	8	8	9	9	5	6	2
Columbia Gar Sil Bow Co.	6	9	19	29	35	50	53	62	69	29.9	15.41	25.8	1.40	35	5	8	10	8	4	0	0	0	0	0	0	0
Tierney Res. Sil Bow Co.	6	14	21	29	43	77	86	95	136	37.8	25.58	31.0	1.52	53	0	0	0	0	2	8	8	9	9	7	6	4
McKinley Res. Granite Co.	4	13	21	33	43	59	106	111	113	38.1	26.21	30.2	1.71	56	3	4	6	5	5	5	5	4	5	5	5	4
Lahman Res. Powell Co.	28	28	35	37	45	102	102	153	153	56.1	37.14	48.5	1.31	12	4	4	0	0	1	0	3	0	0	0	0	0
Gerdts Powell Co.	3	27	53	72	99	122	153	177	183	79.2	40.56	65.5	1.76	45	3	4	6	5	5	5	5	5	5	2	0	0

* See Figure 8 for locations of many of the sites.

Ramsay Area

An ambient air quality study was continued in the Ramsay area by the DHES. This study was conducted around the Stauffer Chemical Company at Silverbow, Montana. This elemental phosphorus plant emits significant quantities of fluorides, sulfur dioxide and particulates (See Table 5).

Sampling was conducted for gaseous fluorides and particulates in the area. Figure 9 shows the relative locations of samplers and the source. Tables 32 through 34 summarize the gaseous fluoride data. The results for sampling of particulate matter are summarized at the bottom of Table 31. The state ambient air quality standard for fluorides was violated on many occasions in the area. Particulate sampling in the area (Tierney Res.) recorded a maximum 24-hour value of 136 ug/m^3 and an annual geometric mean of 31.0 ug/m^3. Sampling for fluorides with a tape sampler recorded a maximum 24-hour value of 3.97 parts per billion. Sampling with fluoride papers (Calcium Formate Paper) recorded a maximum one-month reading at the ESE of Stauffer site of 6.89 ug/cm^2/30 days. This site also recorded the highest annual average of 3.002 ug/cm^2/30 days.

Table 32

Fluoride Data (Tape Sampler)

Yearly Summary Silver Bow County
Values in Parts Per Billion

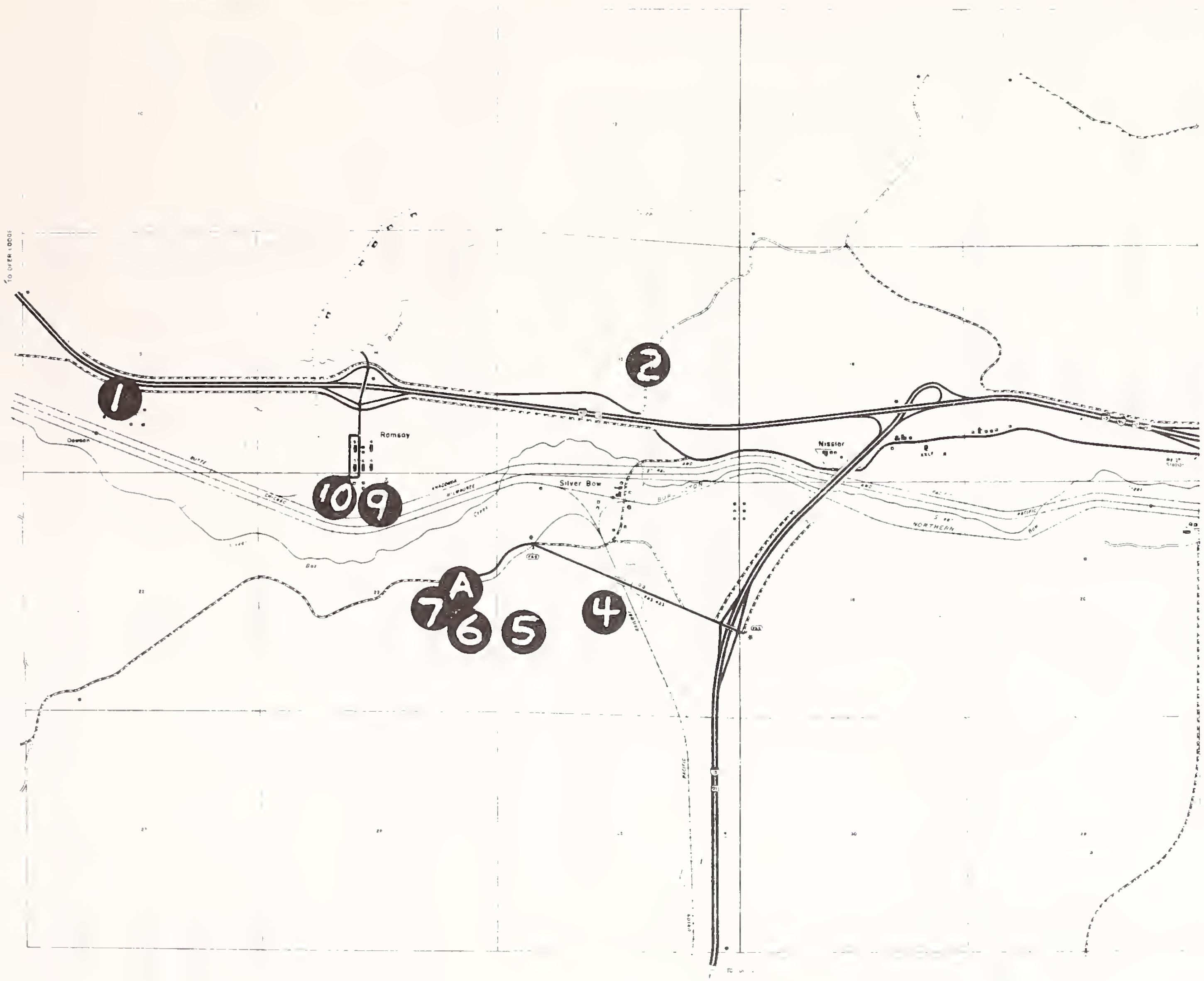
Site	Map* No.	Maximum Reading 1-hr	24-hr	Arith Aver.	No. of 24-hr Readings Exceeding 1.00	2.00	3.00	Dates Site Operated
Tierney Silver Bow County	1	6.29	3.97	0.207	2	1	1	July-Dec

*See Figure 9

On March 19, 1976, Stauffer Chemical Company will be issued an Order of Compliance by the Board of Health and Environmental Sciences. That order will include abatement of visible emissions at the furnace, roaster and condenser areas of the plant. In addition, a contingency plan for control of fluorides will be developed and final compliance with all visible and fluoride rules and standards will be achieved by March 1, 1978.

FIGURE 9

Ramsay Area



Ambient Air Monitors

Map No.	Site Name
1	Ramsay West
2	Ramsay North
4	ESE of Stauffer
5	S of Stauffer
6	S of Stauffer Pond
7	Stauffer Pond #1
8*	Stauffer Pond #2
9	Montana Power Substa
10	Tierney Res.

*Same location as #7.

Major Point Source

Map No.	Source Name
A	Stauffer Chem. Co.

Scale: 1 inch = 0.75 miles

TABLE 33

Gaseous Fluoride Data (Calcium Formate Paper)

Yearly Summary Silver Bow County

Values in micrograms per square centimeter per 30 days

Site	Map** No.	Min.	Max.	Aver.	No. Samples	Months Standard Violated	Months Site Operated
Ramsay West	1	0.51	2.24	1.338	12	12	Jan.-Dec.
Ramsay North	2	0.22	0.99	0.576	12	9	Jan.-Dec.
ESE of Stauffer	4	1.48	6.89	3.002	11	11	Jan.-Dec.
S. of Stauffer	5	0.47	1.22	0.954	11	11	Jan.-Dec.
S. of Stauffer Pond	6	0.56	2.20	1.385	11	11	Jan.-Dec.
Stauffer Pond #1*	7	0.04	40.81	8.448	10	6	Jan.-Dec.
Stauffer Pond #2*	8	1.06	3.98	2.069	11	11	Jan.-Dec.
Montana Power Sub	9	0.38	3.55	2.150	7	7	June-Dec.

* Pond sites (Standard applies is pond emission source)
**See Figure 9

TABLE 34

Gaseous Fluoride Data (Sodium Formate Plates)

Yearly Summary Silver Bow County

Values in micrograms per square centimeter per 30 days

Site	Map** No.	Min.	Max.	Aver.	No. Samples	Months Standard Violated	Months Site Operated
Ramsay West	1	0.69	3.21	1.612	12	12	Jan.-Dec.
Ramsay North	2	0.30	1.38	0.651	9	7	Jan.-Dec.
Silver Bow Exit	3	0.48	1.73	1.097	8	8	Jan.-Dec.
ESE of Stauffer	4	1.91	5.11	3.143	12	12	Jan.-Dec.
S. of Stauffer	5	0.94	1.31	1.175	10	10	Jan.-Dec.
S. of Stauffer Pond	6	0.86	2.20	1.259	8	8	Jan.-Dec.

**See Figure 9.

Garrison Area

The Garrison area was sampled for fluorides and particulates around the Rocky Mountain Phosphates, Inc., phosphate feed plant by the DHES. The plant emits large quantities of fluorides and particulate matter (See Table 5). Late in 1975, the plant was abruptly shut down. Prior to ceasing operation, a plan was being worked out for controlling the fluorides (emitted from both the stack and settling pond) and particulates.

Tables 35 through 37 summarize the fluoride data for the area. Table 31 contains the summary of particulate matter sampled in the area (Lahman residence and Gerdt site). Figure 10 shows the relative locations of the source and air monitors. The federal secondary particulate standard and the state fluoride standard were violated during the year. Particulate sampling recorded a maximum 24-hour value of 183 ug/m^3 and an annual geometric mean of 65.5 ug/m^3 both at the Gerdt site. Sampling for fluorides with a tape sampler at the Gerdt site recorded a maximum 24-hour value of 0.47 parts per billion. Sampling with fluoride papers (Calcium Formate Paper) recorded a maximum one-month value of 10.22 ug/cm^2/30 days and annual average of 3.73 ug/cm^2/30 days and annual average of 3.73 ug/cm^2/30 days. The RMP A site recorded the highest concentrations with a maximum one-month reading of 15.48 and an annual average of 7.69 ug/cm^2/30 days.

Table 35

Fluoride Data (Tape Sampler)

Yearly Summary Powell County
Values in Parts Per Billion

Site	Map* No.	Maximum Reading 1-hr	24-hr	Arith Aver.	No. of 24-hr Readings Exceeded 1.00	2.00	3.00	Dates Site Operated
Gerdts	9	0.83	0.47	0.165	0	0	0	Apr-May

*See Figure 10

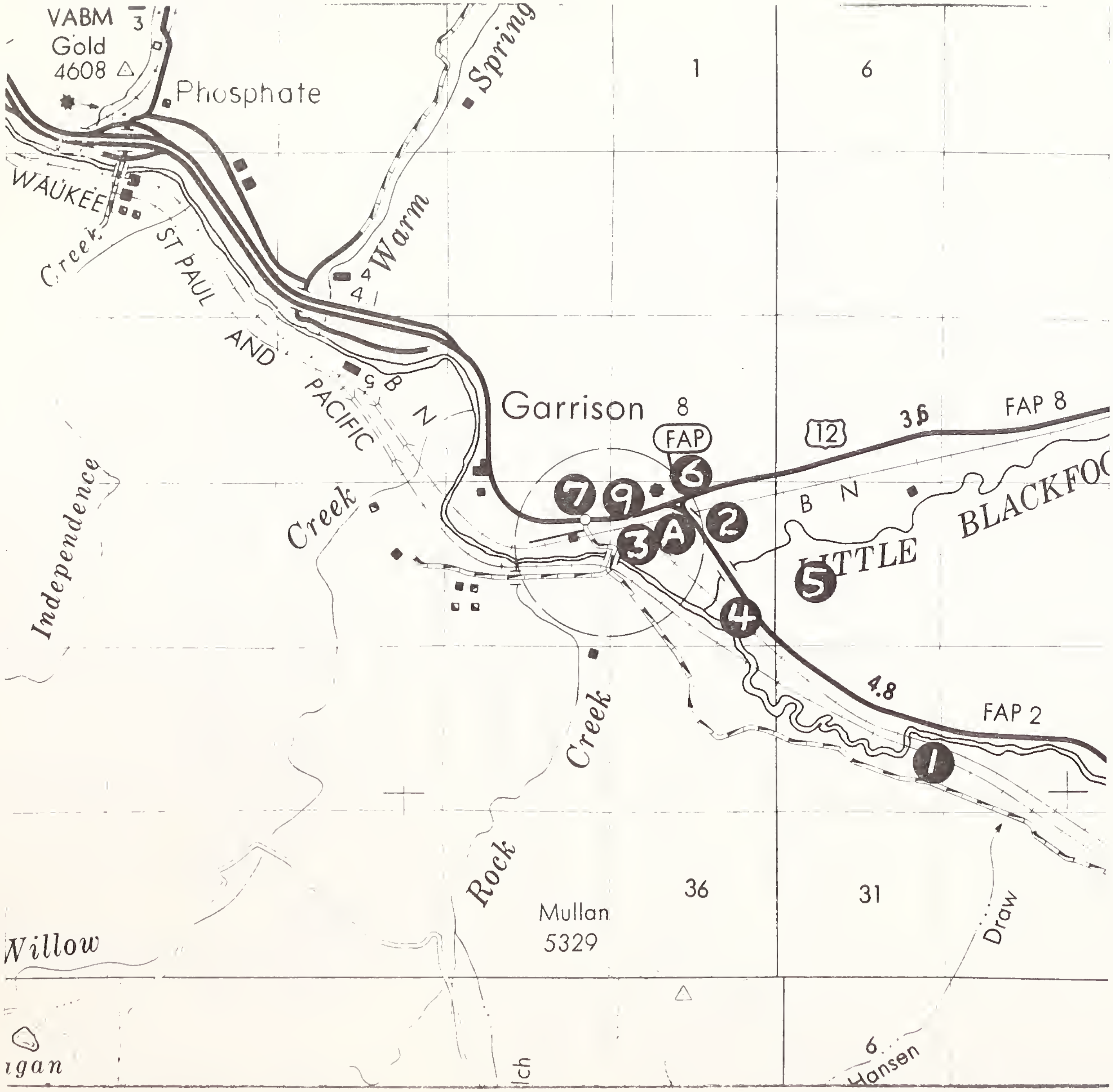


FIGURE 10

Garrison Area

Ambient Air Monitors

Map No.	Site Name
1	Beck
2	Mullenberg
3	RMP A
4	Lahman
5	E. Garrison
6	N. Across Hwy.
7	W. in Garrison
8*	RMP B
9	Gerdts
10*	Pond Edge #1
11*	Pond Edge #2

*Same location as #3

Major Point Source

Map No.	Source Name
A	Rocky Mtn. Phos., Inc.

Scale: 1 inch = 1 mile

TABLE 36

Gaseous Fluoride Data (Calcium Formate Paper)

Yearly Summary Powell County

Values in micrograms of fluoride per square centimeter for 30 days

Site	Map** No.	Min.	Max.	Aver.	No. Samples	Months Standard Violated	Months Site Operated
Beck	1	0.07	1.02	0.42	10	5	Jan.-Dec.
Mullenburg	2	0.86	6.01	2.39	10	10	Jan.-Dec.
RMP A	3	1.71	15.48	7.69	10	10	Jan.-Dec.
Lahman	4	0.70	3.78	1.75	10	10	Jan.-Dec.
E. Garrison	5	0.30	1.56	1.12	4	3	Mar.-Oct.
N. Across Hwy.	6	1.01	10.22	3.73	9	9	Jan.-Dec.
W. in Garrison	7	0.20	1.04	0.54	10	6	Jan.-Dec.
RMP B	8	1.50	10.22	3.46	10	10	Jan.-Dec.
Gerdts	9	0.43	3.19	1.76	6	6	Jan.-Oct.
Ponds Edge #1*	10	16.19	36.87	27.38	3	0	Aug.-Oct.
Ponds Edge #2*	11	25.95	90.69	48.77	4	0	Sept.-Dec.

* Pond Sites (Standard applies is pond emission source)

TABLE 37

Gaseous Fluoride Data (Sodium Formate Plates)

Yearly Summary Powell County

Values in micrograms of fluoride per square centimeter per 30 days

Site	Map** No.	Min.	Max.	Aver.	No. Samples	Months Standard Violated	Months Site Operated
Beck	1	0.0	1.54	0.46	12	6	Jan.-Dec.
N. Across Hwy.	6	0.28	14.70	3.92	12	10	Jan.-Dec.
RMP B	8	2.03	14.70	4.69	12	12	Jan.-Dec.
NW on Hill	12	0.41	11.73	3.02	10	10	Mar.-Dec.
Gerdts	9	0.46	4.66	2.04	9	9	Jan.-Sep.

** See Figure 10.

Philipsburg Area

Sampling was concluded around the Louisiana Pacific and Flint Valley tepee burners in the Philipsburg area by the DHES. Monitors were used for particulate matter - total dustfall and total suspended particulates. Both of the sources emit significant amounts of particulates, carbon monoxide, and oxides of nitrogen. However, early in 1975, the Flint Valley tepee burner was shut down. The total dustfall samplers were removed shortly after the shutdown.

Violations of the state ambient air standard for total dustfall were recorded prior to the Flint Valley shutdown. Results are summarized in Table 38 and near the bottom of Table 31 (McKinley Res. - 0640005). The maximum 24-hour particulate concentration recorded at the McKinley Resident site was 113 ug/m^3. The site also had an annual geometric mean of 30.2 ug/m^3. Total dustfall sampling in the area resulted in the Flint Valley Office site recording the highest one-month value of 201 tons/square mile.

Table 38

Total Dustfall Data

Yearly Summary Granite County
Values in Tons/Square Mile

Site	Min.	Max.	Aver.	No. Samples	Months Standard Violated	Months Site Operated
E of Church	2	3	2.5	2	0	Jan-Feb
Whitberg Ranch	2	7	4.5	2	0	Jan-Feb
Whitberg Horse Pd.	1	1	1.0	2	0	Jan-Feb
McKinley Res.	1	1	1.0	2	0	Jan-Feb
Ousley	7	110	58.5	2	1	Jan-Feb
Pburg. Airport	1	2	1.5	2	0	Jan-Feb
Flint Val. Off.	5	201	103.0	2	1	Jan-Feb

Eastern Montana

In Region 143 special studies were performed on the background air quality for large areas of eastern Montana and more specifically for the Colstrip area. A study was also initiated for a new source in the Colstrip area - The Montana Power Company Colstrip Unit 1 Power Plant. Both studies were conducted by the DHES. The Colstrip Power Plant started operation in the latter part of 1975. The new plant is a source of particulate, sulfur dioxide, oxides of nitrogen, hydrocarbons, carbon monoxide and many trace elements. Table 7 shows the emissions of particulates and sulfur dioxide.

Sampling was performed for many of the pollutants emitted by the source before and after construction and startup of the plant. No attempt was made to separate the data before and after startup in this report. The background data is the subject of another report (Gelhaus, 1976). The study in the large areas of eastern Montana was conducted to obtain data on this area prior to development such as the Colstrip Power Plant.

Figure 11 shows the relative locations of the samplers and the source for the Colstrip area. No map is given for the large eastern Montana study. Tables 39 through 45 summarize the data for the Colstrip area and the general eastern Montana study. Results show very low concentrations of all pollutants except ozone. The highest particulate concentrations were recorded at the Glendive (Dawson County) and BN sites (Rosebud County) with maximum 24-hour values of 130 and 129 ug/m^3 and annual geometric means of 18.9 and 18.6 ug/m^3, respectively. Near zero concentrations of sulfur dioxide and oxides of nitrogen were measured in the studies. Non-methane hydrocarbons at the BN site (Rosebud County) showed a maximum 1-hour value of 0.10 ppm. Ozone values were recorded very near the federal standard with the BN and McRae sites recording maximum 1-hour readings of 0.07 and 0.08 ppm, respectively. Fluoride concentrations were also very near zero with the maximum one-month value of 0.04 ug/cm^2/30 days recorded at the BN site.

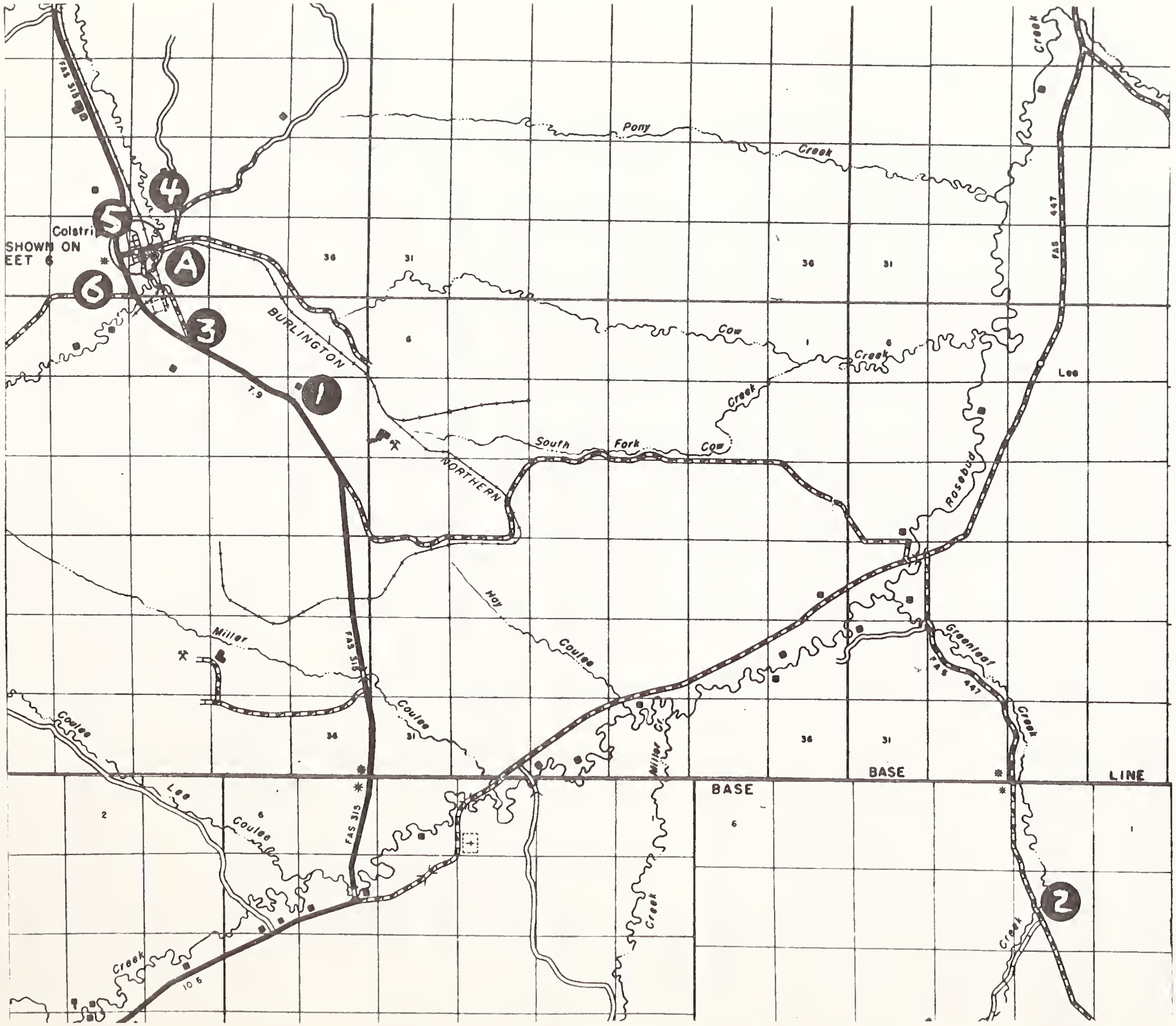


FIGURE 11

Colstrip Area
Rosebud County

Ambient Air Monitors

Map No.	Site Name
1	BN Site
2	McRae Site
3	Halfway
4	Antenna Hill
5	Sewage Lagoon
6	Colstrip West

Major Point Sources

Map No.	Source Name
A	Montana Power Co.

Scale: 1 inch = 2 miles

TABLE 39

TOTAL SUSPENDED PARTICULATE DATA YEARLY SUMMARY EASTERN MONTANA

JAN. 1975 - DEC. 1975

Station*	Minimum	Frequency Distribution (% of values equal to or less than stated one)							Maximum	Arith. Mean	Arith. Std. Dev.	Geo. Mean	Geo. Std. Dev.	Total No. Obs.	Number of Samples Reported Per Month											
		10%	30%	50%	70%	90%	95%	98%							Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
BN Site Rosebud Co.	1	7	13	19	27	50	65	77	129	25.0	20.99	18.6	1.88	113	10	9	11	10	10	10	7	10	10	6	10	10
McRae Site Rosebud Co.	3	4	6	9	13	22	30	45	59	12.0	10.32	9.4	1.57	78	9	9	11	10	10	2	0	0	4	4	10	9
Ekalaka Carter Co.	5	5	5	6	7	10	13	13	13	7.4	2.99	7.0	1.14	7	0	0	0	0	0	0	0	0	0	2	4	1
Scobey Daniels Co.	6	6	6	6	6	9	9	9	9	7.5	2.12	7.4	1.09	2	0	0	0	0	0	0	0	0	0	0	0	2
Glendive Dawson Co.	7	7	7	10	14	130	130	130	130	40.2	59.90	18.9	5.66	4	0	0	0	0	0	0	0	0	0	1	3	0
Lindsay Dawson Co. (107349)	6	6	7	13	14	20	20	29	29	13.2	7.22	11.6	1.33	10	0	0	0	0	0	0	0	0	4	4	2	0
Lindsay Dawson Co. (107312)	6	6	7	12	15	28	28	41	41	15.1	11.22	12.3	1.52	10	0	0	0	0	0	0	0	0	4	4	2	0
Fort Peck McCone Co.	6	6	6	15	24	26	26	26	26	17.8	9.18	15.4	1.57	4	0	0	0	0	0	0	0	0	3	1	0	0
Broadus Powder River Co.	3	3	5	10	14	26	34	43	43	13.2	10.65	10.1	1.77	20	0	0	0	0	0	0	0	0	5	5	5	5
Poplar Roosevelt Co.	3	4	8	10	15	41	64	69	69	18.8	19.33	12.7	2.15	20	0	0	0	0	0	0	0	0	5	5	5	5

TABLE 40

Continuous Monitor Data

Yearly Summary Rosebud County

Values in Parts Per Million

Site	Map* No.	Pollutant	Maximum Reading 1-Hour	3-Hour	8-Hour	24-Hour	Arith. Aver.	Standards Exceeded 1-Hour	3-Hour	8-Hour	24-Hour
BN Site	1	Total Hydrocarbons	2.10	2.08	---	1.99	1.699	---	---	---	---
		Methane HC	3.80	3.03	---	1.87	1.655	---	---	---	---
		Non-Methane HC	0.10	0.10	---	0.02	0.001	---	0	---	---
		Nitrogen Dioxide	0.0	0.0	---	0.0	0.0	---	---	---	---
		Ozone	0.07	0.07	---	0.06	0.037	0	---	---	---
		Sulfur Dioxide	0.02	0.01	---	0.0	0.0	0	0	---	0
McRae Site	2	Carbon Monoxide	0.0	0.0	0.0	---	0.0	0	---	0	---
		Nitric Oxide	0.0	0.0	---	0.0	0.0	---	---	---	---
		Nitrogen Dioxide	0.0	0.0	---	0.0	0.0	---	---	---	---
		Oxides of Nitrogen	0.0	0.0	---	0.0	0.0	---	---	---	---
		Ozone	0.08	0.08	---	0.07	0.053	0	---	---	---
		Sulfur Dioxide	0.0	0.0	---	0.0	0.0	0	0	---	0

* See Figure 11.

TABLE 41

Sulfur Dioxide Bubbler Data

Yearly Summary Eastern Montana

Values in Parts Per Million

Site	Map[+] No.	Geometric Mean	Arithmetic Mean	Maximum* 24-Hour Value	Dates Site Operated
BN Site	1	0.0000	0.0000	0.002	Jan.-Dec.
McRae Site	2	0.0000	0.0000	0.002	Jan.-Dec.
Fort Peck	NS**	0.0000	0.0000	0.000	Sept.-Oct.
Lame Deer	NS**	0.0000	0.0000	0.000	Sept.-Nov.

* Minimum detectable level is 0.01 ppm for 24 hours.
** NS - Not shown on map.
[+] See Figure 11.

TABLE 42

Nitrogen Dioxide Bubbler Data

Yearly Summary Eastern Montana

Values in Parts Per Million

Site	Map[+] No.	Geometric Mean	Arithmetic Mean	Maximum* 24-Hour Value	Dates Site Operated
BN Site	1	0.0017	0.0023	0.007	Jan.-Dec.
McRae Site	2	0.0009	0.0015	0.004	Jan.-Dec.
Fort Peck	NS**	0.0040	0.0050	0.008	Sept.-Oct.
Lame Deer	NS**	0.0018	0.0038	0.008	Sept.-Nov.

[+] See Figure 11.
* Minimum detectable level is 0.003 ppm for 24 hours.
** NS - Not shown on map.

TABLE 43

Sulfation Rate Data

Yearly Summary Rosebud County

Values in milligrams sulfur trioxide per 100 square centimeters per day

Site	Map* No.	Min.	Max.	Aver.	No. Samples	Months Standard Violated	Months Site Operated
BN Site	1	0.0	0.02	0.005	11	0	Jan.-Dec.
McRae Site	2	0.0	0.04	0.01	10	0	Jan.-Dec.
Halfway Site	3	0.0	0.0	0.0	11	0	Jan.-Dec.
Antenna Hill	4	0.0	0.01	0.005	10	0	Jan.-Dec.
Sewage Lagoon	5	0.0	0.26	0.052	10	0	Jan.-Dec.
Colstrip West	6	0.0	0.0	0.0	3	0	Jan.-Mar.

TABLE 44

Gaseous Fluoride Data (Calcium Formate Paper)

Yearly Summary Rosebud County

Values in micrograms of fluoride/square centimeter/30 days

Site	Map* No.	Min.	30 Days Max.	Aver.	No. Samples	Months Standard Violated	Months Site Operated
BN Site	1	0.0	0.04	0.02	10	0	Jan.-Dec.
McRae Site	2	0.0	0.01	0.00	9	0	Jan.-Dec.

TABLE 45

Gaseous Fluoride Data (Sodium Formate Paper)

Yearly Summary Rosebud County

Values in micrograms of fluoride/square centimeter/30 days

Site	Map* No.	Min.	30 Days Max.	Aver.	No. Samples	Months Standard Violated	Months Site Operated
BN Site	1	0.0	0.0	0.0	11	0	Jan.-Dec.
McRae Site	2	0.0	0.0	0.0	11	0	Jan.-Dec.
Halfway Site	3	0.0	0.0	0.0	11	0	Jan.-Dec.
Antenna Hill	4	0.0	0.0	0.0	10	0	Jan.-Dec.

* See Figure 11

Missoula Area

In Region 144, a special study was continued in the Missoula area by the Missoula City-County Health Department. This study is orientated both for population and point-source type pollution sources.

The major industrial sources of air pollution in the Missoula Valley study area are, by and large, wood products plants. Hoerner-Waldorf's pulp and paper mill, U.S. Plywood's and Evans Product's plywood plant and Evans Product's particleboard plant are the major emitters. A number of sawmills also contribute their emissions to Missoul's air. Table 46 summarizes emission estimates for the major point sources in the area.

Other sources of emissions contributing to Missoula's problem include motor vehicles, forest slash burning and unpaved roads. Table 46 also summarizes the most recent data on area source emissions for Missoula County. This data is taken from a draft study conducted for the AQB and is subject to revision. The other categories in the table are largely fuel consumption for heating and small manufacturing.

Tables 47 and 48 summarize the ambient air quality data collected in the area. Figure 12 shows the relative locations of the sources and air monitors. Samples were taken for particulates and sulfur dioxide. Sulfur dioxide was monitored only briefly with none detected. Particulate levels were in excess of both federal and state ambient air quality standards at several locations in the area. The Target Range site was the only site recording a reading in excess of the federal primary standard with a maximum 24-hour reading of 373 ug/m^3. The Courthouse site had the highest annual geometric mean with a value of 68.1 ug/m^3. Sulfur dioxide measurements at the Courthouse site recorded no detectable levels.

Compliance schedules have been established for some of the point sources in the area. Final compliance for Evans Products particleboard plant is scheduled for October of 1977 and Intermountain Lumber is scheduled for final compliance by July 1977. U.S. Plywood should achieve final compliance in mid 1976. The two former programs will result in reduction of particulate emissions of about 75% from Intermountain and more than 90% from the particleboard plant.

Missoula County is also the subject of an Air Quality Maintenance Plan for maintaining particulate and carbon monoxide levels with the standards through 1985.

FIGURE 12

Missoula Area
Missoula County

Ambient Air Monitors

Map No.	Site Name
1	Courthouse
2	J-B Field
3	Bonner One
4	Target Range
5	Frenchtown

Major Point Sources

Map No.	Source Name
A	Hoerner Waldorf
B	U. S. Plywood
C	Evans Products (particleboard)
D	Evans Products (plywood)

Scale: 1 inch = 2 miles

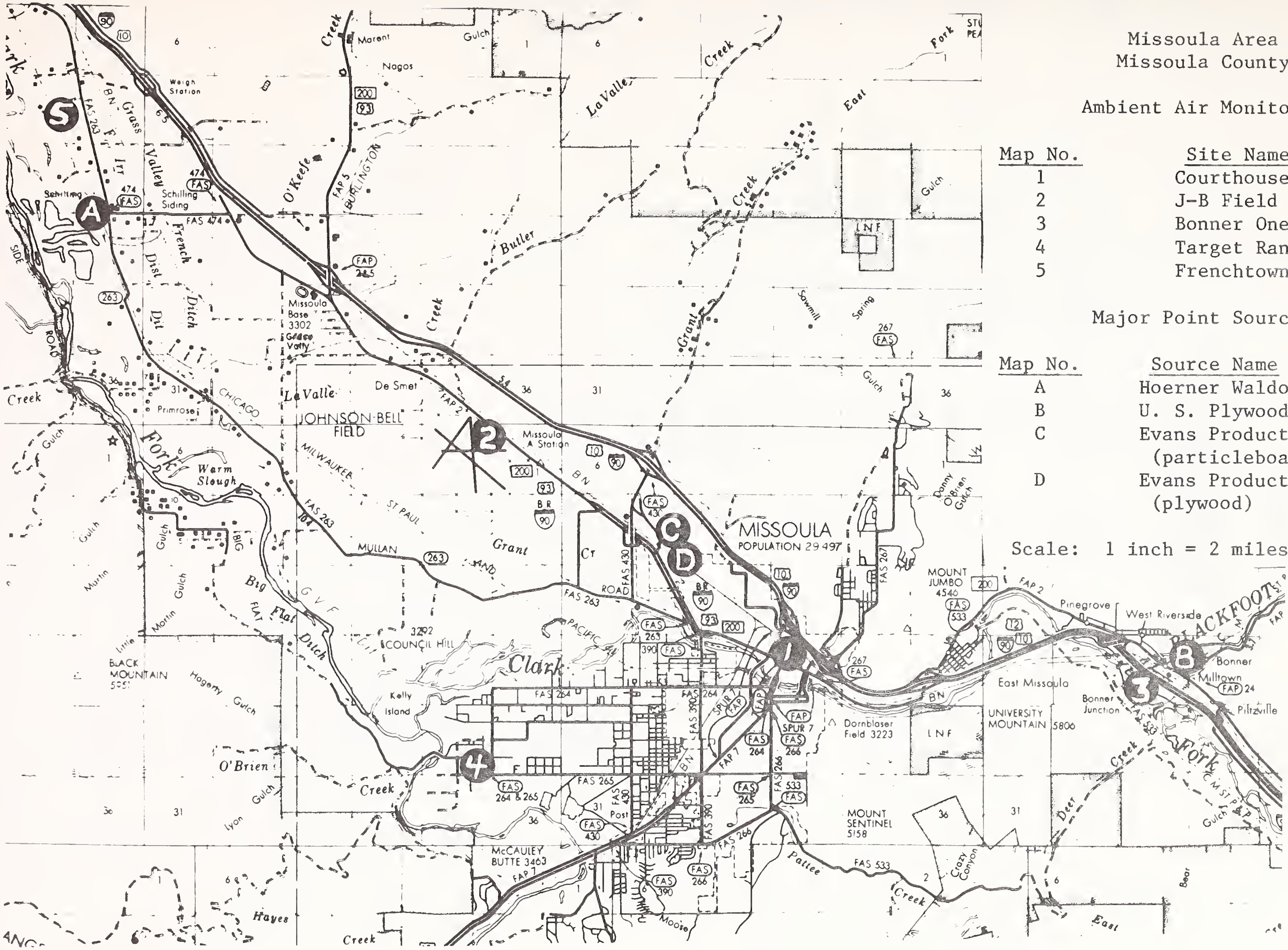


TABLE 46

MISSOULA AREA MAJOR SOURCES
ESTIMATED EMISSIONS
(TONS PER YEAR)

Point Source	SO_2	Part.	NO_x	HC	CO	TRS*
Evans Products (particleboard)	Neg.	706	153	75	150	
Evans Products (plywood)	34	246	228	151	46	
Hoerner Waldorf	910	988	1008	115	1350	675
Intermountain Lumber	8	49	55	11	11	
Missoula White Pine Sash	9	164	61	12	12	
U.S. Plywood	224	842	1472	297	298	
Area Sources						
Unpaved Roads	Neg.	45,767				
Slash Burning	Neg.	10,896				
Transportation	212	353				
All other Categories	1214	1,227				

* TRS - Total Reduced Sulfur

TABLE 47

TOTAL SUSPENDED PARTICULATE DATA YEARLY SUMMARY MISSOULA COUNTY

JAN 1975 - DEC. 1975

Station*	Minimum	Frequency Distribution (% of values equal to or less than stated one)							Maximum	Arith. Mean	Arith. Std. Dev.	Geo. Mean	Geo. Std. Dev.	Total No. Obs.	Number of Samples Reported Per Month											
		10%	30%	50%	70%	90%	95%	98%							Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
Courthouse	12	33	55	70	95	132	156	172	240	78.2	39.80	68.1	1.36	351	28	27	30	30	31	27	30	30	30	30	27	31
J-B Field	5	16	28	37	53	79	90	99	141	43.9	25.02	36.9	1.48	345	30	28	30	28	28	24	29	31	30	27	29	31
Bonner One	1	18	31	47	67	100	127	160	237	55.3	37.09	43.7	1.77	304	30	25	31	27	29	28	31	29	29	27	18	0
Target Range	6	15	25	38	57	101	134	233	373	54.1	55.69	38.8	1.86	226	28	28	31	30	30	27	30	22	0	0	0	0
Frenchtown	7	14	22	33	43	73	83	106	200	38.5	26.50	31.5	1.51	285	0	0	15	29	31	30	31	31	27	31	29	31

TABLE 48

Bubbler Data Yearly Summary Missoula County

Values in Parts Per Million

Site	Map* No.	Sulfur Dioxide			Nitrogen Dioxide			Dates Site Operated
		Geometric Mean	Arithmetic Mean	Maximum 24-Hour Value	Geometric Mean	Arithmetic Mean	Maximum 24-Hour Value	
Courthouse Missoula	1	0.00	0.00	0.00	0.0069	0.0070	0.008	Oct.

* See Figure 12.

Kalispell-Columbia Falls Area

A special study was continued in the Kalispell-Columbia Falls area by DHES. This study is orientated mainly toward point-source type pollution sources

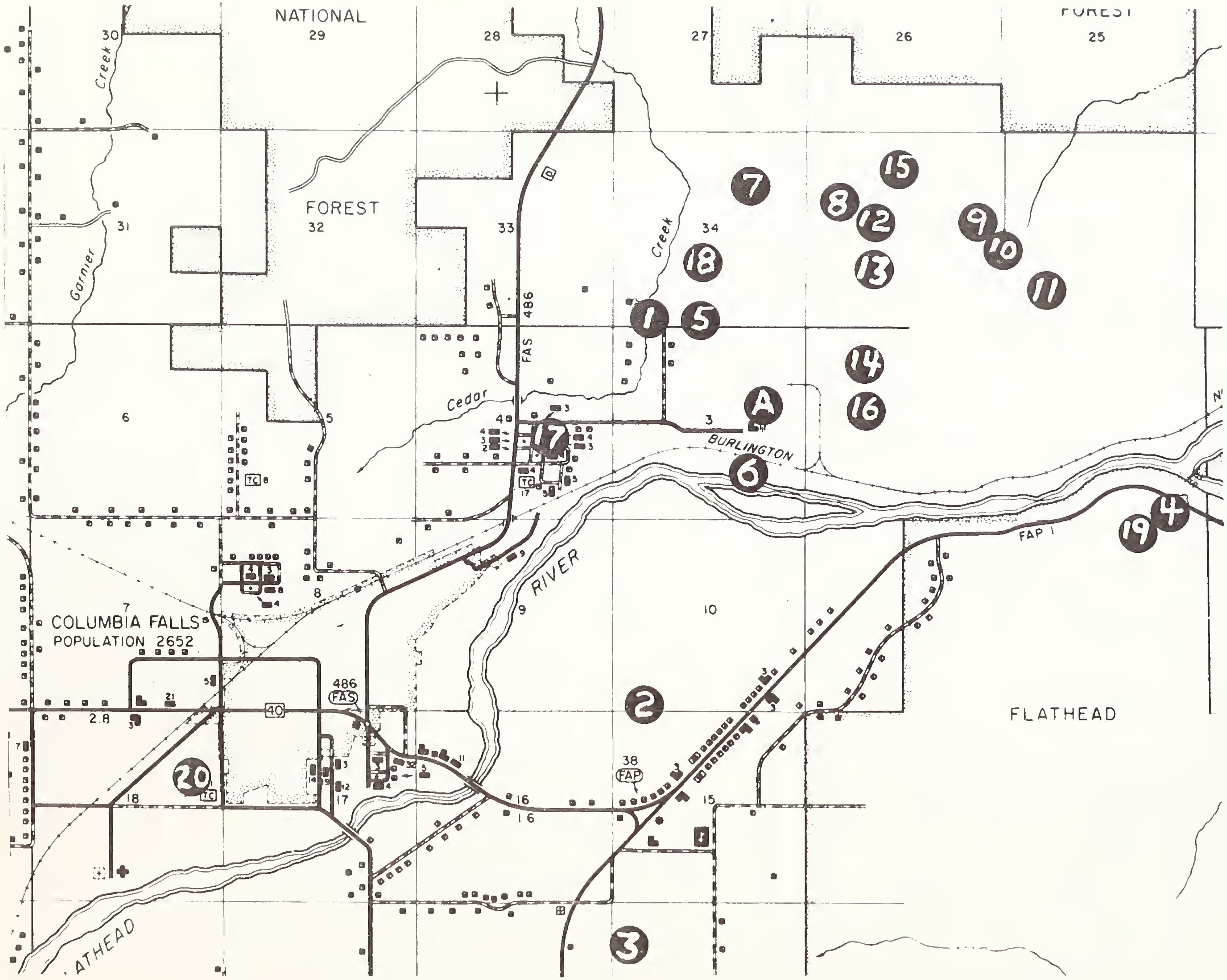
The aluminum plant and several wood products plants are the major industrial emission sources in the Flathead Valley. The greatest concentration of sources is located in and around the town of Columbia Falls. Within a 3 mile radius are located the aluminum plant, a plywood plant, a fiberboard plant, and 4 sawmills. With 4 miles of Kalispell, one finds a plywood plant and 3 sawmills. Estimates of annual emissions of particulate and sulfur oxides for the major point sources are presented in Table 49.

Area sources in the area are significant contributors to atmospheric pollutant loadings in the Kalispell-Columbia Falls area, as in most of Montana, especially the western portion. Table 49 also provides emission estimates for certain area source categories. These data were derived from a draft study conducted for the DHES and may be revised. The numbers represent Flathead County, not just Kalispell-Columbia Falls area.

Tables 50 through 52 summarize the ambient air quality data for the northwestern Montana area. The map in Figure 13 shows the relative locations of the aluminum plant and related air monitors. Results of sampling in the area show particulate levels in excess of both federal and state ambient standards at several locations. Fluoride levels are also in excess of state ambient air quality standards at many locations in the Columbia Falls area. The High School site (Columbia Falls) and the Downard Res. site (Kalispell) recorded the highest 24-hour particulate levels with values of 232 and 216 ug/m^3, respectively. The Downard Res. site (Kalispell) and Sverdrup site (Libby) recorded the highest annual geometric mean particulate levels with values of 88.0 and 63.0 ug/m^3, respectively. Fluoride sampling with Calcium Formate Papers resulted in the maximum one-month reading at the Teakettle Mtn. #10 site (TK #10) of 16.97 ug/cm^2/30 days. The Teakettle Mtn. #2 (TK #2) site recorded the highest annual average fluoride concentration with a value of 5.908 ug/cm^2/30 days.

Anaconda Aluminum is the only source in this area currently on a compliance schedule. This schedule provides for compliance by June of 1979, and should reduce fluoride emissions by about 65% and particulate emissions by about 45%. The Kalispell area is also the subject of an Air Quality Maintenance Plan for the maintaining of particulate levels within ambient standards through 1985.

FIGURE 13



Kalispell-Columbia Falls Area

Ambient Air Monitors

Map No.	Site Name
1	Dehlbom Res.
2	Feirstein
3	R E Owen
4	Badrock
5	Dehlbom Field
6	Anaconda S
7	Teakettle #1
8	Teakettle #2
9	Teakettle #3
10	Teakettle #4
11	Teakettle #5
12	Teakettle #6
13	Teakettle #9
14	Teakettle #10
15	Teakettle #11
16	Teakettle #12
17	Aluminum City
18	Trailer
19	Kenas Residence
20	Columbia Falls H.S.

Major Point Sources

Map No.	Source Name
A	Anaconda Aluminum

Scale: 1 inch = 0.80 miles

TABLE 49

KALISPELL-COLUMBIA FALLS AREA
MAJOR SOURCES ESTIMATED EMISSIONS

Point Source	Pollutant (Tons per year) SO_2	Part.	NO_x	HC	CO	F
Anaconda Aluminum	--	1560	--	--	--	456
C & C Plywood	9	70	63	13	19	
Kal-Mont Lumber	1	17	3	28	325	
Klinger Lumber	1	18	4	36	435	
Louisiana-Pacific	10	89	98	15	20	
Montana Lumber & Plywood	1	18	3	28	325	
Plum Creek Lumber	435	34	440	130	606	
Stoltze Land & Lumber	12	13	76	74	722	
Superior Building Co.	1	219	2	20	237	
Area Sources*						
Unpaved Roads	Neg.	66550				
Slash Burning	Neg.	26484				
Transportation	1275	319				
All Other Categories	228	965				

* Flathead County

TABLE 50

TOTAL SUSPENDED PARTICULATE DATA YEARLY SUMMARY NORTHWESTERN MONTANA

JAN. 1975 - DEC. 1975

Station	Minimum	Frequency Distribution (% of values equal to or less than stated one)							Maximum	Arith. Mean	Arith. Std. Dev.	Geo. Mean	Geo. Std. Dev.	Total No. Obs.	Number of Samples Reported per Month											
		10%	30%	50%	70%	90%	95%	98%							Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
High School Columbia Falls	13	16	40	58	88	166	190	232	232	76.1	58.89	56.7	1.95	23	0	0	0	0	0	4	2	3	5	4	4	1
Dehlbom Res. Flathead Co.	7	7	12	21	23	43	68	68	68	25.8	20.04	19.8	1.82	9	0	0	0	0	0	0	0	3	2	1	0	3
McLaughlin Flathead Co.	7	13	43	79	105	143	167	174	174	78.7	49.37	59.1	2.20	39	5	4	4	5	3	4	5	1	5	3	0	0
Downard Res. Kalispell	42	42	42	92	92	129	216	216	216	105.6	71.01	88.0	1.59	5	0	0	0	0	0	0	0	0	0	0	0	5
Sverdrup Libby	20	26	43	64	93	150	156	161	196	75.1	44.07	63.0	1.46	54	5	4	6	4	3	5	4	5	4	5	5	4

TABLE 51

GASEOUS FLUORIDE DATA (SODIUM FORMATE PLATES) YEARLY SUMMARY COLUMBIA FALLS AREA VALUES IN MICROGRAMS FLUORIDE PER SQUARE CENTIMETER PER 30 DAYS

Site	Map+ No.	Min.	Max.	Aver.	No. Samples	Months Standard Violated	Months Site Operated
Dehlbom Res.	1	0.13	1.45	0.612	12	9	Jan-Dec
Feirstein	2	0.18	1.11	0.497	12	10	Jan-Dec
R. E. Own	3	0.0	0.26	0.157	12	0	Jan-Dec
Badrock Sta.	4	0.12	0.42	0.284	12	5	Jan-Dec
Cedar Ridge Road	NS**	0.0	0.0	0.0	6	0	Jul-Dec
Dehlbom Field	5	0.26	1.38	0.732	12	9	Jan-Dec
Anaconda S	6	2.84	12.38	5.120	10	10	Jan-Dec
TK #1	7	0.08	4.50	2.892	9	9	Jan-Sept*
TK #2	8	3.98	6.67	4.970	4	4	Jun-Sept*
TK #3	9	0.18	2.08	0.886	8	3	Jan-Sept*
TK #4	10	0.0	0.69	0.194	8	2	Jan-Sept*
TK #5	11	0.0	0.69	0.135	8	1	Jan-Sept*
TK #6	12	0.28	5.72	4.254	8	7	Jan-Sept*
Hamilton #1	NS	0.0	1.16	0.462	9	8	Jan-Sept*
TK #7	NS	0.28	0.89	0.453	6	5	Jan-Sept*
TK #8	NS	0.19	0.79	0.451	11	9	Jan-Dec
TK #9	13	1.06	7.75	2.641	9	9	Jan-Sept*
TK #10	14	0.69	28.00	5.120	9	9	Jan-Sept*
TK #11	15	1.43	8.00	2.875	8	8	Jan-Sept*
TK #12	16	6.76	15.33	8.357	9	9	Jan-Sept*
Aluminum City	17	0.42	1.76	0.957	9	9	Jan-Sept*
Trailer	18	0.40	1.81	0.863	12	12	Jan-Dec
Kenas Res.	19	0.45	0.64	0.557	3	3	Jul-Sept*
Glacier Park #1	NS	0.13	0.36	0.217	6	1	Jun-Dec
Glacier Park #2	NS	0.11	0.36	0.264	10	3	Jan-Dec
Glacier Park #3	NS	0.0	0.0	0.0	5	0	Aug-Dec
Glacier Park #4	NS	0.0	0.0	0.0	5	0	Aug-Dec
Glacier Park #5	NS	0.0	0.0	0.0	5	0	Aug-Dec
Glacier Park #6	NS	0.0	0.0	0.0	5	0	Aug-Dec
Glacier Park #7	NS	0.0	0.31	0.180	5	1	Aug-Dec
Glacier Park #8	NS	0.0	0.25	0.060	5	0	Aug-Dec
Glacier Park #9	NS	0.0	0.37	0.168	5	1	Aug-Dec
Glacier Park #10	NS	0.0	0.43	0.166	5	1	Aug-Dec

+ See Figure 13

* Samples unable to be collected due to heavy snow cover

** NS - Monitor locations not shown on map

TABLE 52

GASEOUS FLUORIDE DATA (CALCIUM FORMATE PAPER) YEARLY SUMMARY COLUMBIA FALLS AREA VALUES IN MICROGRAMS FLUORIDE PER SQUARE CENTIMETER PER 30 DAYS

Site	Map+ No.	Min.	Max.	Aver.	No. Samples	Months Standard Violated	Months Site Operated
Dehlbom Res.	1	0.16	0.87	0.457	12	7	Jan-Dec
Feirstein	2	0.10	0.70	0.355	12	6	Jan-Dec
R.E. Owen	3	0.06	0.18	0.118	12	0	Jan-Dec
Badrock Sta.	4	0.08	0.35	0.200	12	4	Jan-Dec
Cedar Ridge Rd.	NS**	0.01	0.02	0.012	6	0	Jul-Dec
Dehlbom's Field	5	0.29	1.00	0.556	12	11	Jan-Dec
Anaconda S	6	2.44	8.34	4.437	12	12	Jan-Dec
TK #1	7	1.52	4.09	2.680	9	9	Jan-Sept*
TK #2	8	4.77	10.65	5.908	9	9	Jan-Sept*
TK #3	9	1.00	2.32	1.309	7	7	Jan-Sept*
TK #4	10	1.45	3.55	1.889	8	8	Jan-Sept*
TK #5	11	0.0	0.45	0.229	7	1	Jan-Sept*
TK #6	12	3.44	6.60	4.143	9	9	Jan-Sept*
Hamilton #1	NS	0.24	0.90	0.396	9	4	Jan-Sept*
TK #7	NS	0.11	0.37	0.233	7	2	Jan-Sept*
TK #8	NS	0.90	0.49	0.249	11	3	Jan-Dec
TK #9	13	2.84	7.40	4.488	9	9	Jan-Sept*
TK #10	14	1.41	16.97	3.252	9	9	Jan-Sept*
TK #11	15	1.31	4.15	2.252	9	9	Jan-Sept*
TK #12	16	2.61	16.36	4.683	9	9	Jan-Sept*
Aluminum City	17	0.14	1.06	0.467	12	8	Jan-Dec
Trailer	18	0.34	1.33	0.707	12	12	Jan-Dec
Kenas Res.	19	0.22	0.38	0.300	3	1	Jul-Sept*
Glacier Park #1	NS	0.14	0.23	0.164	12	0	Jan-Dec
Glacier Park #2	NS	0.14	0.26	0.187	12	0	Jan-Dec
Glacier Park #3	NS	0.01	0.04	0.026	5	0	Aug-Dec
Glacier Park #4	NS	0.0	0.02	0.010	5	0	Aug-Dec
Glacier Park #5	NS	0.0	0.02	0.006	5	0	Aug-Dec
Glacier Park #6	NS	0.03	0.07	0.045	4	0	Aug-Dec
Glacier Park #7	NS	0.09	0.28	0.172	6	0	Aug-Dec
Glacier Park #8	NS	0.06	0.17	0.097	6	0	Aug-Dec
Glacier Park #9	NS	0.09	0.28	0.155	6	0	Aug-Dec
Glacier Park #10	NS	0.08	0.26	0.133	6	0	Aug-Dec

+ See Figure 13

* Samples unable to be taken due to heavy snow cover

** NS - Monitor locations not shown on map

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